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IN THE MATTER OF AN APPLICATION OF CALGARY POWER LTD. FOR APPROVAL OF THE CONSTRUCTION AND OPERATION OF AN ADDITION TO THE SUNDANCE POWER PLANT, AND FOR AN ORDER FOR ITS INTERCONNECTION

C1

1972

ENERGY RESOURCES CONSERVATION BOARD
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REPORT TO
THE LIEUTENANT GOVERNOR IN COUNCIL

IN THE MATTER OF AN APPLICATION OF CALGARY POWER LTD. FOR APPROVAL OF THE CONSTRUCTION AND OPERATION OF AN ADDITION TO THE SUNDANCE POWER PLANT, AND FOR AN ORDER FOR ITS INTERCONNECTION

1972

ENERGY RESOURCES CONSERVATION BOARD
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I INTRODUCTION

Application and Hearing

Calgary Power Ltd. applied under section 7 of The Hydro and Electric Energy Act for approval of the addition of two 375 megawatt electric generating units and related facilities to its Sundance Power Plant on the south side of Lake Wabamun, and applied under section 14 of the Act for an order directing the connection of the additional units to its transmission lines.

The application was heard at Edmonton on January 11, 12 and 13, 1972 by the Energy Resources Conservation Board with G. W. Govier, P. Eng., V. Millard, J. I. Strong, P. Eng. and N. Berkowitz sitting.

Appearances

Table I lists the parties to the proceeding and where applicable, their representatives at the hearing. The interveners, other than Canadian Utilities and the Cities of Edmonton, Calgary and Lethbridge, were residents or cottagers or their representatives in the Lake Wabamun area and intervened to express concern regarding the various environmental effects of electric power generation in the area. As a result of a corporate reorganization, the Canadian Utilities system is now operated by Alberta Power Limited (Alberta Power).

Because of the number of interveners who could not be expected to be fully familiar with the Board's practices, the

TABLE I

PARTIES and APPEARANCES

	Abbreviation of Name Used in Report	Represented By	Witnesses
Calgary Power Ltd.	Calgary Power	D.O. Sabey, Q.C.	E.J. MacLeod, P.Eng. T.D. Stanley, P.Eng. W. Saponja, P.Eng. E.W. Smith, P.Eng. T.M. Schulte, P.Eng. T.W. Crowe, P.Eng.
Wabamun Sailing Club		E.M. Davison	E.M. Davison Dr. R.S. Henderson
Alan H. Nash			
James Paron			
Paul H. Carpenter		Paul H. Carpenter	Paul H. Carpenter
L. G. Thomas		L. G. Thomas	L. G. Thomas
Canadian Utilities, Limited	Canadian Utilities	W.G. Sterling, P.Eng.	W.G. Sterling, P.Eng.
A.D. McTavish and G.L. Roper		A.D. McTavish	A.D. McTavish
Summer Village of Kapasiwin		Neil F. Duncan,M.D. G. W. Lewis	Neil F. Duncan, M.D.
A. W. Hardy, M.D.			
City of Calgary		W.K. Moore, Q.C.	W.E. Hawkins, P.Eng. A.A. Bishop, P.Eng.
Dr. M.X.M. Coughlan		Dr. M.X.M. Coughlan	Dr. M.X.M. Coughlan

	Abbreviation of Name Used in Report	Represented By	Witnesses
Patricia Coflin and Hugh J. Coflin			
City of Edmonton	Edmonton Power	A.F. Macdonald, Q.C.	
G. K. Wynn		G. K. Wynn	G. K. Wynn
J. E. Sydie			
City of Lethbridge		J. A. Hammond	
Village of Point Alison		Mrs. Heath	

Board varied its rules for this hearing and accepted all submissions that were received to the close of business on the day preceding the hearing. Submissions that were received, but not supported by the intervener or witnesses at the hearing, were written into the transcripts. In such cases, the other parties were given the opportunity to indicate what questions they would have addressed to the witnesses and the applicant was given full opportunity to rebut any statement in the submissions.

The Applicant, the Background to the Application and the Application

Calgary Power is a dominion company and it has no parent, subsidiary or affiliated companies. It was organized in 1909 as Calgary Power Company Limited. In 1910 Calgary Power Company Limited purchased the Calgary Power and Transmission Company. In 1947 it was reorganized under the new name of Calgary Power Ltd. and the assets were transferred to the new company. It is 97 per cent Canadian owned.

The Calgary Power system is the largest electric energy system in the Province. Its proportion of the interconnected system energy requirement in 1970 was 59.8 per cent, compared to 21 per cent for Edmonton Power and 14.7 per cent for Alberta Power (Canadian Utilities). It generates electric energy using both hydro developments and thermal plants. It is interconnected with the systems of Alberta Power and Edmonton Power and these three utilities have a Reserve Sharing Agreement, the principal points of which were set forth in Appendix C of ERCB Report 71-C-HE.(1)

These three major electric utilities serve roughly the southern two-thirds and the north-west quarter of the Province. The Calgary Power system is also connected to the Lethbridge and Medicine Hat power plants and supplies power to many other municipalities and rural electrification projects in the southern and central portions of the Province.

The applicant has two power plants located toward the east end of Lake Wabamun, the Wabamun Plant on the north shore and the subject Sundance Plant on the south shore. The first unit of the Sundance Plant was commissioned in November 1970. The second unit is under construction and is scheduled for commissioning in November 1973. These units are of 300 megawatt gross capacity.* The approvals and authorizations for the construction and operation of the first two units are listed in Appendix A to this report.

The present application is for the addition of two 375 megawatt gross capacity electric generating units at the Sundance Plant located in Sections 17 and 20 of Township 52,

---

(1) In the Matter of an Application of Canadian Utilities, Limited for Approval of the Construction and Operation of an Addition to the Battle River Power Plant, and for an Order for its Interconnection. 1971.

* Gross capacity = (net capacity at the plant bus) + (station service capacity),
e.g. 300 megawatt = 286 megawatt + 14 megawatt.

Range 4, West of the 5th Meridian, about eight miles southeast of Seba Beach. The capacity of the plant after the proposed additions would be 1350 megawatts gross capacity and the fuel used would be coal. The coal required would be obtained from strip mines near the plant - the Highvale Mine. The stack gases produced in connection with the proposed two units would be exhausted to the atmosphere through a single 510-foot high stack and would contain a maximum of 55 tons per day of sulphur dioxide, a similar amount of oxides of nitrogen and 5 tons per day of particulate matter when the two units are operated at maximum continuous rating (MCR). Ash and grit would be conveyed to a settling pond and cooling water requirements, drawn from the lake and amounting to a maximum of 1800 cubic feet per second when the plant is generating 1350 megawatts, would be returned to the lake after use. The third unit would be commissioned in October 1976 and the fourth unit a year later in October 1977. The additional plant, during its operating life, would be used for base load generation and the electric energy would be transmitted east and south to the Calgary Power load centres.

The Position of the Interveners

The interveners could be roughly classed into three groups. First, residents and cottagers, secondly Canadian Utilities and Edmonton Power, and lastly the cities of Calgary and Lethbridge.

The residents and cottagers expressed concern regarding possible environmental effects of the operation of power plants at the Sundance and Wabamun sites. The main concern was the great increase in weeds at the eastern end of the lake over the past decade which has greatly reduced the recreational utility of the area. Another major concern was the fly ash emitted from the stacks at the plants.

Canadian Utilities and Edmonton Power limited their interventions to commenting that the Calgary Power application was in accordance with the plans of the other utilities that are signatories to the Reserve Sharing Agreement. Canadian Utilities is one of an international group of utility companies, the same group that includes Alberta's major gas distribution utilities, Northwestern Utilities, Limited and Canadian Western Natural Gas Company Limited.

The City of Calgary in its submission observed that the proposed additions of Calgary Power and those of Edmonton Power proposed in an application heard at the same sittings would provide generating requirements up to the year of 1978, but after that further major generating facilities in Alberta would be required for the next stage of load growth. For this purpose it advocated the formation of a joint venture to study and provide future generating plants. The City of Calgary would wish to participate in such a joint venture.

The City of Lethbridge did not have a submission of its own, but it expressed concurrence with the City of Calgary's submission and its desire also to participate in such a joint venture.

The Board's Concern and Responsibilities

The Hydro and Electric Energy Act came into force on June 1, 1971, and placed hydro and electric energy within the Board's purview for the first time. Section 2 of the Act states the following:

"2. The purposes of this Act are

(a) to provide for the appraisal of the reserves and productive capacity of hydro energy and electric energy in Alberta,

(b) to provide for the appraisal of the requirements for electric energy in Alberta and of markets outside Alberta for electric energy generated in Alberta,

(c) to provide for the economic, orderly and efficient development in the public interest of the hydro energy and the generation of electric energy in Alberta,

(d) to secure the observance of safe and efficient practices in the public interest in the development of hydro energy and in the generation, transmission and distribution of electric energy,

(e) to control pollution and ensure environment conservation in the development of hydro energy and in the generation, transmission and distribution of electric energy, and

(f) to provide for the recording and timely and useful dissemination of information regarding hydro energy and the generation, transmission and distribution of electric energy in Alberta."

The Board in the discharge of the duties cast upon it in accordance with clauses (c), (d) and (e) is concerned with those matters affecting or which could affect the economic, orderly and efficient development and the safe and efficient practices in the public interest in the generation of electric energy in Alberta and the control of pollution and the ensurance of environment conservation in connection with such development. Any approval that may be issued by the Board may be subject to conditions to ensure the satisfaction of the public interest related to economic, orderly, efficient and safe development and related to the control of pollution and the ensurance of environment conservation. The Board is not the sole agent with responsibilities related to the control of pollution and the ensurance of environment conservation, as the Department of the Environment administers The Department of the Environment Act, The Clean Air Act and The Clean Water Act. Notwithstanding any approval given or any conditions imposed by the Board, the operator of a power plant must also comply with the requirements of these other statutes.

The purposes of clauses (a) and (b) of section 2 quoted above would be met through a general appraisal of electric energy supply and demand in Alberta but would not require detailed consideration in connection with an application such as the subject application. The purposes described in clauses (c), (d) and (e) are distinctly relevant to the present application. The considerations involved with respect to clauses (c) and (d) and to some extent with respect to clause (e) are affected by the fact that the application is for an addition to facilities at an existing site rather than for approval of a power plant at a new location. For these reasons the Board's consideration of the present application will not involve all aspects of Provincial reserves, productive capacity and requirements of electric energy, nor an extensive examination of the choice of fuels. However, the Board is generally concerned about the adequacy of the reserves of suitable fuel available near the power plant. And, it is concerned with the part the additional facilities will play in the economic, orderly and efficient generation of electric energy in Alberta. The purpose described in clause (f) is relevant only to the statistical reports to be required from operators of power plants and these will be defined in due course by generally applicable regulations.

Section 7 of The Hydro and Electric Energy Act states, in part,

"7. (1) No person shall construct or operate

(a) a hydro development, or

(b) a power plant,

unless the Board, by order and with the authorization of the Lieutenant Governor in Council, has approved the hydro development or power plant."

"(2) The holder of an approval under this section shall not make a significant alteration in his hydro development or power plant unless the Board has amended the approval or issued a new approval to cover the alteration."

"(3) The authorization of the Lieutenant Governor in Council is not required where the Board amends an approval or issues a new approval under this section or issues a new approval for the purpose only of consolidating and revising a previous approval and subsequent amendments to it."

Section 35 of the Act states that,

"35. (1) Where, at the time of the commencement of this Act a person is

(a) operating a hydro development, power plant, transmission line or electric distribution system, or

(b) constructing a hydro development, power plant, transmission line or electric distribution system under authority provided for in previous legislation,

> he shall until further order be deemed to be the holder of a subsisting approval, permit or licence covering the operation or construction of his hydro development, power plant, transmission line or electric distribution system.
>
> "(2) Where a person is deemed to be the holder of an approval, permit or licence by reason of subsection (1), the Board may issue to him an approval, permit or licence in substitution for the one he is deemed to hold under subsection (1), upon such notice if any as the Board deems suitable."

In considering the present application, the Board is in a position analogous to that when it considered the Canadian Utilities application as reported in ERCB Report 71-C-HE, and similar treatment is appropriate. In accordance with the provisions of section 35, subsection (1), clause (a) Calgary Power is deemed to be the holder of an approval for the existing Sundance power plant (Units 1 and 2). The present application is made under section 7 of the Act. It could be considered under subsection (2) of section 7, i.e. as an application for an amendment to the approval Calgary Power is deemed to hold under section 35, subsection (1), clause (a). If the application were so considered, then in accordance with subsection (3) of section 7 of the Act, any issuance by the Board of an approval for the overall Sundance project would not require the authorization of the Lieutenant Governor in Council.

Alternatively, having regard for the size of the expansion proposed, the fact that it could be considered a nearly independent power plant in itself, the environmental matters involved, and the fact that the applications for the first two units at Sundance were not considered by this Board, the application could be considered under subsection (1), and the issuance of an approval would require the authorization of the Lieutenant Governor in Council. The Board chooses this latter option.

II SPECIFIC ISSUES OF THE APPLICATION

The Board considers the following to be the matters of principal concern with respect to the application.

(1) The need for and the suitability of the proposed increased capacity.

Is the additional capacity required at the time proposed to serve the consumers supplied by Calgary Power? Are the proposed units of suitable size to serve the needs of the Calgary Power system? Will the proposed units, when added to the existing generating units of Calgary Power, also suit the requirements of the Provincial interconnected system and serve the interests of the citizens of Alberta? Will the additional capacity as applied for "provide for economic, orderly and efficient generation of electrical energy in Alberta"?

(2) The suitability of the choice of the energy resource and the adequacy of the fuel reserves.

Is the proposed energy resource, i.e. coal, the most suitable and economic? If so, are the reserves of coal adequate for a plant installation of the proposed capacity?

(3) The suitability of providing the increased capacity at the Sundance site.

Is the Sundance site a suitable location to provide additional capacity to serve the consumers supplied by Calgary Power? Will the added generation at this site adequately serve the Provincial interconnected system whereby the citizens of the Province as a whole will also benefit?

(4) The energy conversion efficiency.

Are the proposed units efficient from the viewpoint of energy resource utilization? Does each unit incorporate all economically justifiable modern refinements in the interests of efficiency, economy and safety?

(5) The relationship of the proposed addition to the existing power plant.

Should the application for the addition to the power plant be considered separately from the existing plant or should the entire operation be reviewed as a single application? Should an approval be considered for the proposed addition only or for the total Sundance development?

(6) The impact of the proposal on the environment.

What is the impact of the present plan on the environment? What will be the added effect of the two additional units? What will be the combined effect of the total Sundance development on the atmosphere, the surface or lake water, and the land? Does the applicant plan to install adequate protective measures? If not, what additional requirements must be provided to safeguard the total environment?

(7) The adequacy of present planning for the expansion of electric generation and transmission facilities in Alberta.

Is the present type of planning carried out by Calgary Power, Alberta Power and Edmonton Power as the three principal electric energy generating utilities in the Province adequate? Should other electric utility operators be included in the planning group? Does the present system of planning furnish the Board with sufficient information so that it may ensure economic, orderly and efficient development in the public interest of hydro energy and generation of electric energy in the Province? How may the present planning be improved in order to satisfy the foregoing requirements?

III THE NEED FOR AND THE SUITABILITY OF THE PROPOSED INCREASED CAPACITY

Views of the Applicant

(1) Load Growth

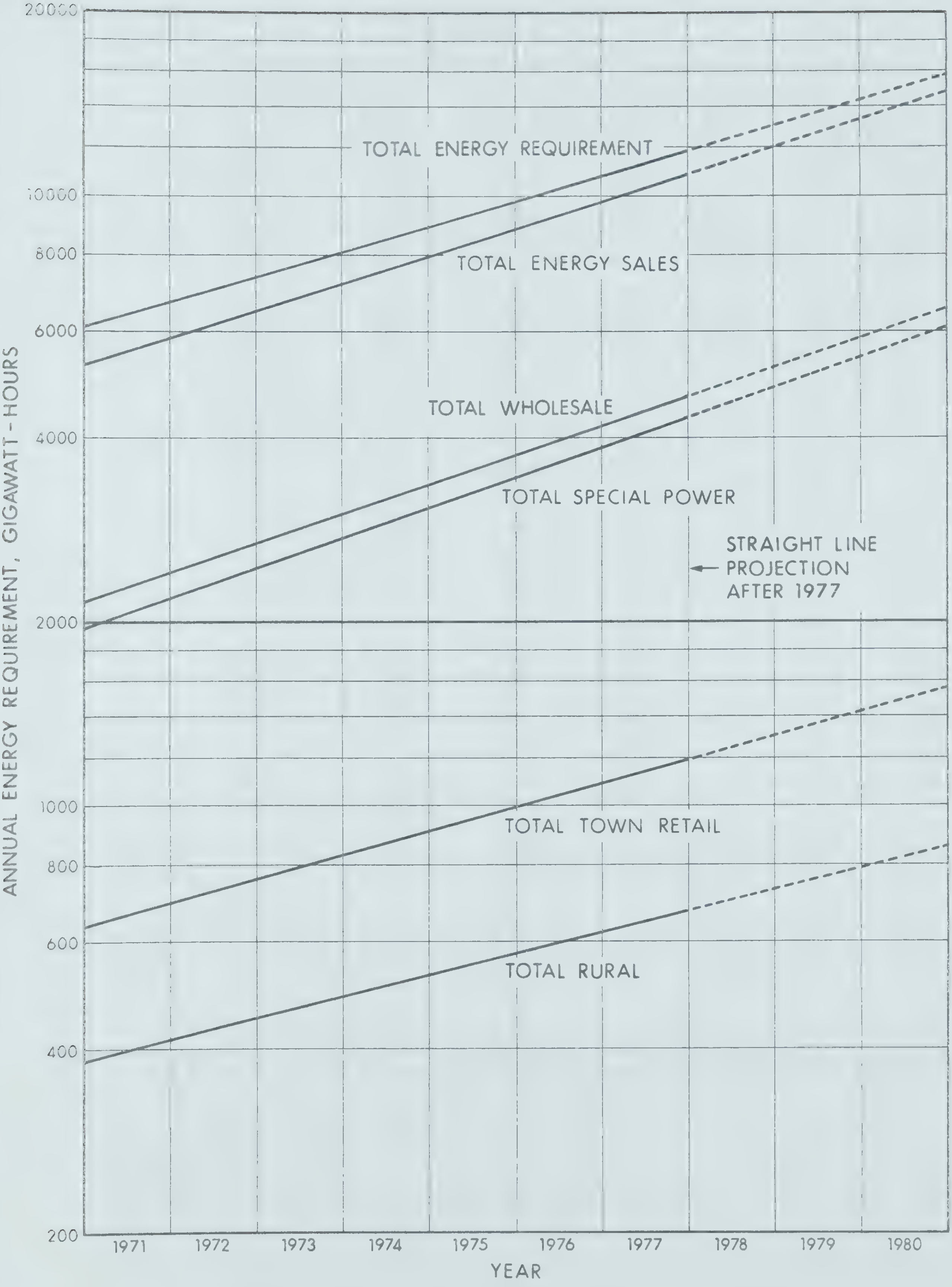
The applicant stated that it expects the historical trend of the high rate of growth for energy consumption and an increasing system load factor will continue with only a slight reduction in the late seventies. Calgary Power predicted that the present growth rate of energy uses of 11 to 12 per cent per annum is expected to taper off to 9 per cent between 1978 and 1980, and the annual load factor would probably increase slowly from its 1970 value of 61 per cent to about 65 per cent in 1980 so that the corresponding 1978 to 1980 annual growth of peak load would be slightly less than 9 per cent for energy growth.

Calgary Power stated that these projections were derived by combining individual projections for each class of customer: residential, rural, commercial, industrial and large wholesale and large industrial.

The large wholesale and large industrial classifications were forecast on the basis of long range planning by each customer. The remaining classifications, each of which contain a large number of customers, were forecast using historical trends and a judgment assessment of future significant changes in the economy of Alberta.

Calgary Power's individual and total forecasts are summarized in Figure III-1 and Table III-1. The applicant stated that the

FIGURE III-1



SUMMARY OF ENERGY REQUIREMENTS FORECAST
CALGARY POWER LTD. SYSTEM

ENERGY RESOURCES CONSERVATION BOARD
CALGARY, ALBERTA

TABLE III-1

SCHEDULE OF PROPOSED NEW GENERATING CAPACITY

		ANNUAL REQUIREMENT		GENERATION (AT YEAR-END)				
		ENERGY REQUIRED GWH	NET PEAK (WINTER) MW**	INSTALLED CAPACITY MW	CAP. ADDED MW	RES. CAP. %	THERMAL CAPACITY FACTOR WITH NEW UNITS*	
YEAR	SYSTEM						IN OCT.	3 MO. LATE
1971 (WINTER) 71 - 72	CP	6763	1206	1540	+ 0	27.7	71.8	71.8
	EP	2141	456	561	+ 0	23.0	43.6	43.6
	CU	1397	295	345	+ 0	16.9	46.2	46.2
	TOTAL	10301	1957	2446	+ 0	25.0	57.8	57.8
1972	CP	7639	1270	1643	+103	29.4	74.5	74.5
	EP	2363	498	561	+ 0	12.7	48.0	48.0
	CU	1660	357	475	+130	33.1	50.2	54.9
	TOTAL	11662	2125	2679	+233	26.1	62.6	63.7
1973	CP	8059	1382	1929	+286	39.6	77.1	83.1
	EP	2609	545	732	+171	34.3	49.3	53.1
	CU	1821	382	475	+ 0	24.3	43.8	43.8
	TOTAL	12489	2309	3136	+457	35.8	60.8	64.5
1974	CP	8876	1518	1929	+ 0	27.1	70.8	70.8
	EP	2880	595	732	+ 0	23.0	44.9	44.9
	CU	2008	420	475	+ 0	13.1	48.3	48.3
	TOTAL	13764	2533	3136	+ 0	23.8	58.1	58.1
1975	CP	9774	1667	2029	+100	21.7	78.1	79.8
	EP	3180	651	732	+ 0	12.4	49.6	49.6
	CU	2167	453	625	+150	38.0	48.3	52.1
	TOTAL	15121	2771	3386	+250	22.2	63.1	64.8
1976	CP	10912	1858	2381	+352	28.1	78.3	83.5
	EP	3510	711	903	+171	27.0	51.7	54.7
	CU	2356	490	625	+ 0	27.6	43.0	43.0
	TOTAL	16778	3059	3909	+523	27.8	62.7	65.8
1977	CP	12182	2071	2733	+352	32.0	70.5	74.4
	EP	3875	777	903	+ 0	16.2	49.0	49.0
	CU	2602	540	675	+ 50	25.0	46.6	47.5
	TOTAL	18659	3388	4311	+402	27.2	59.7	61.7
1978	CP	13348	2263	2733	+ 0	20.8	67.8	67.8
	EP	4278	849	1074	+171	26.5	51.6	54.0
	CU	2853	589	675	+ 0	14.6	48.2	48.2
	TOTAL	20479	3701	4482	+171	21.1	59.8	60.5
1979	CP	14584	2466	3085	+352	25.1	71.8	75.0
	EP	4722	928	1074	+ 0	15.7	50.2	50.2
	CU	3127	642	815	+140	26.9	50.3	52.9
	TOTAL	22433	4036	4974	+492	23.2	61.7	63.8

* NEW UNITS ARE CREDITED WITH FULL ENERGY PRODUCTION DURING OCTOBER, NOVEMBER, AND DECEMBER; UNLESS THEY ARE THREE MONTHS LATE, IN WHICH CASE THEY ARE NOT CREDITED WITH ANY ENERGY PRODUCTION BEFORE YEAR-END. "THERMAL CAPACITY FACTOR" IS BASED ON THERMAL CAPACITY AND ENERGY.

** CP NET PEAK = ACTUAL PEAK - 78 MW INTERRUPTIBLE LOAD

CP = CALGARY POWER LTD.
EP = EDMONTON POWER
CU = CANADIAN UTILITIES, LIMITED - NOW ALBERTA POWER LIMITED

important point of the forecasts is that its system will need an addition of 685 MW (megawatt) in capability between 1975 and 1978 to supply the expected increase of 596 MW in hourly peak load plus 15 per cent reserve. Calgary Power stated,that assuming optimum energy production from all plants, including Sundance Units 1 and 2, there would be the following energy deficiencies:

1. For the 12 months ending September 30, 1976, the Calgary Power system will probably be deficient 570 GWH, and to provide this energy the system will require an approximate input of 150 MW for 3800 hours, and
2. For the following 12 months to September 30, 1977, the system will probably be deficient 1300 GWH, and to provide this will require an input at the rate of about 325 MW net for 4,000 hours.

Calgary Power noted that the 4,000 hours during which the deficiency must be remedied are split into periods of about 80 hours per week during which the system would be able to absorb the energy if it is available. Calgary Power predicted that British Columbia Hydro would not have any reserves available before 1977, and Alberta Power and Edmonton Power combined would be able to provide perhaps 100 MW of the 150 MW required in 1975 to 1976, and 150 MW of the 325 MW required in 1976 to 1977.

(2) Reserve Requirement

The applicant expressed opinions on three types of reserves:

quick start and spinning reserve, energy reserve and capacity reserve. As the first type does not apply in the case of a large thermal unit, and as the block additions chosen will almost inevitably result in considerably more than 15 per cent capacity reserve, Calgary Power stated that energy reserve is the critical objective of the generating units proposed. The importance of energy reserve to the applicant shown by the relatively low capacity factor of Calgary Power's 788 MW, 1975 hydro system, which will produce only 1800 GWH of energy and may carry reserve energy equivalent to only 2 weeks output from a 300 MW thermal unit, but which will provide quick start and spinning reserve and "black start" capability for the whole Provincial interconnected system.

The applicant did not present a firm recommendation as to what proportion of firm load should be taken to represent good practice in providing a good energy and capability reserve, but did indicate that the Provincial interconnected system should be in a position, at any time, to meet the energy requirement for a few months when the largest unit on the system might be continuously out of service. Just prior to bringing a new large generating unit into service an owner of a utility that was part of the system might plan to be short of energy and capacity reserve and to rely on reserves carried by the rest of the system. Calgary Power submitted that capacity reserve, where it is not already large as a natural adjunct of the energy reserve, should be determined largely by judgment, and a combination of the requirements of the Reserve Sharing Agreement together with such criteria to be considered as a reserve equal to the capability of the largest unit plus 5 per cent of the peak load, and the capacity of the largest unit plus the next largest unit.

(3) The Size and Scheduling of the Units Proposed

Calgary Power stated that the original plan for the Sundance plant contemplated two 300 MW units, as actually were or are being installed followed by two 500 MW units. The 500 MW units, if installed as originally planned, would be about the same fraction of the total system capability in the late seventies as the first 300 MW unit at Wabamun was in the late sixties, and 500 MW units would have had a 14 per cent advantage over 300 MW units in terms of capital cost in dollars per kilowatt. Calgary Power states that experience with existing 300 MW units, and the experiences of others with 500 and 600 MW units, have made it hesitant to install units larger than about 300 MW at this time. Other factors affecting this decision were stated to be that: the 14 per cent advantage in capital cost of the larger unit would be counterbalanced by increased carrying charges on the larger block additions to capability; additional reserve approximately equal to the difference between the unit size and a 300 MW unit would be required for the larger unit size; new units are not normally larger than 8 to 10 per cent of the interconnected capability of a system, and the Alberta interconnected system of the late seventies would not be able to withstand the sudden disconnection of a 500 MW unit from the system. Calgary Power said it concluded that, after a consideration of all the factors and the application of a good deal of informed judgment, a block addition size should be chosen and then scheduled to come into service as late as possible having regard for the load forecast and necessary reserve. Calgary Power accordingly chose as its proposed block additions two of a nominal 300 MW unit size with an improved design each of which would give a maximum continuous rating (MCR) Of 352 MW net at the plant high voltage bus. The scheduling of these units and the associated reserve capacity is shown in Table III-1, which also shows a possible gas turbine installation of 100 MW capacity. The applicant stated that such a gas turbine installation would be the subject of a later application if the energy requirements experienced in the early seventies bear out the forecast presented in connection with this application.

Views of the Interveners

The residents and cottagers of the Wabamun area were concerned about the environmental aspects of the proposed addition to the Sundance plant. The consensus among these people was that no generating facilities should be installed until the environmental problems were fully resolved.

Edmonton Power stated that the proposed additions appeared to be compatible with additions planned by it and by Canadian Utilities. Edmonton Power said it had not studied the Calgary Power submission in detail and it did not comment on technical or economic comparisons of the various unit sizes which might be installed at the Sundance site.

Canadian Utilities stated that the proposed additions at the Sundance Plant were generally in accordance with the provisions of the Reserve Sharing Agreement and were compatible with the plans of Canadian Utilities and Edmonton Power. Canadian Utilities did not comment on the size of unit chosen.

The City of Calgary agreed that additional generating capacity would be required but questioned the validity of the applicant's arguments with respect to the 14 per cent saving in capital cost per kilowatt for the 500 MW size of unit. This intervener argued that the larger unit might look more attractive if the 14 per cent saving were viewed over the life time of the unit and not merely compared to capital charges for the first year or two of the unit's life. The City of Calgary did not disagree with the applicant's arguments about the extra reserve being required, but expressed the view that the economy of scale for the larger units should be seriously considered. In addition, the City of Calgary stated that additions after those currently being applied for should be sized having regard to the overall Provincial requirement and that feasibility studies should be initiated to explore the benefits of a joint venture at the most economic and advantageous site.

Views of the Board

(1) Load Growth

The Board has considered the forecast of load growth rate of approximately 10 per cent until 1980, presented by Calgary Power and Edmonton Power, and also similar forecasts presented earlier in connection with the Battle River Power plant extension. After a hearing in 1970 on Provincial requirements for gas, the Board adopted a Provincial long term average annual electric energy load growth forecast of 8 per cent extending into the 1980's. The National Energy Board has, from time to time, published forecasts showing annual load growth of 7 per cent for Canada and 8 per cent for Alberta for periods extending into the 1980's. During the 20 years to and including 1971, the average annual growth of electric energy requirements in Alberta has been more than 10 per cent and at the present time there are no indications that there will be a significant reduction in the growth of energy requirements before 1980. Also, it is generally accepted as prudent in short term planning to use the most recent trend without applying any arbitrary reduction to the rate of annual growth.

The Board accepts the load forecasts of both Calgary Power and Edmonton Power as being realistic for present planning of the electric system of the Province into the late-Seventies. The forecast by Edmonton Power and Calgary Power, of a gradual increase of annual load factor to perhaps 5 per cent higher than experienced in 1971 is also accepted as reasonable in the light of present economic conditions.

(2) Reserve Requirement, Size and Scheduling of the Units Proposed

Calgary Power and Edmonton Power each presented a qualitative discussion of the reserve margins required by their individual systems and by the interconnected Provincial system. Neither appeared to have made a detailed quantitative study of the reserve question. Edmonton Power referred to conclusions resulting from such studies performed elsewhere on the continent. Such conclusions would have been more relevant if they had resulted from calculations based on the Alberta system.

The Board understands that many operators of large electric utilities and power pools perform quantitative reliability calculations based on recognized principles of statistical analysis and probability methods. Some of the literature available on the subject of reserve margin suggests that systems with firm peak demand of 2000 MW or more, or with 10 or more major generating units, find such calculations essential for their generation planning. The electric industry in Alberta has understandably not considered such calculations necessary in the past, but with a 1971 firm peak demand of about 2000 MW, and a number of different sizes of generating units as shown in Table III-2, a more precise method of evaluating reserve requirements would now seem appropriate for future planning of the interconnected system. The Board recognizes that informed judgment is important when setting reserve margins and that errors in forecasting and unforeseen changes in the economy tend to limit the confidence in the forecast on which reserve margins are based, but it believes the time has arrived when such judgment should have the support of specifically applicable quantitative analysis.

TABLE III-2

FORECAST OF THE NUMBER OF LARGE GENERATING UNITS ON THE INTERCONNECTED SYSTEM

THE NOMINAL SIZE OF LARGE UNITS (OVER 49 MW) CLASSIFIED IN SIZE RANGE SHOWN

YEAR	75 MW	150 MW	300 MW	TOTAL OF UNITS OVER 49 MW	
	(50 - 100 MW)	(101 - 250 MW)	(251 - 400 MW)	NUMBER	MW
TOTAL IN 1969	■■■■ ■■■	■■ ■■	■	12	1395
INSTALLED 1970	■■■■ ■■■	■■□ ■■	■□	14	1852
INSTALLED 1971	■■■■ ■■■	■■■ ■■	■■	14	1852
PROPOSED IN 1972	■■■■□ ■■■□	■■■ ■■□	■■	17	2085
PROPOSED IN 1973	■■■■■ ■■■■	■■■□ ■■■	■■ □	19	2542
PROPOSED IN 1974	■■■■■ ■■■■	■■■■ ■■■	■■ ■	19	2542
PROPOSED IN 1975	■■■■■□ ■■■■□	■■■■ ■■■□	■■ ■	22	2792
PROPOSED IN 1976	■■■■■■ ■■■■■	■■■■□ ■■■■	■■ ■□	24	3315
PROPOSED IN 1977	■■■■■■ ■■■■■□	■■■■■ ■■■■	■■□ ■■	26	3717
PROPOSED IN 1978	■■■■■■ ■■■■■■	■■■■■ ■■■■□	■■■ ■■	27	3888
PROPOSED IN 1979	■■■■■■ ■■■■■■	■■■■■□ ■■■■■	■■■ ■■□	29	4380

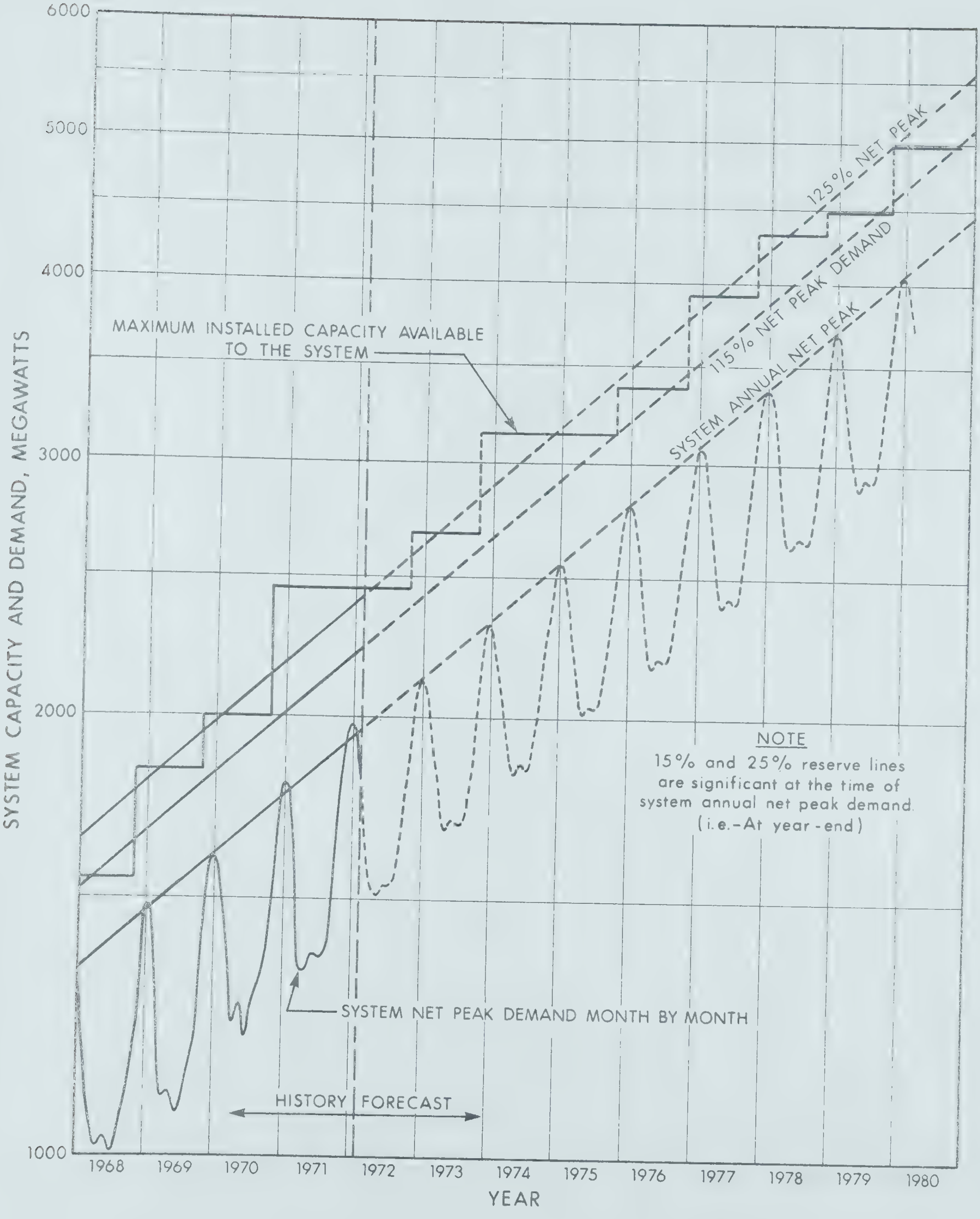
IN 1969 THE SYSTEM ALSO INCLUDED 24 THERMAL UNITS EACH LESS THAN 50 MW AND 10 HYDRO PLANTS WITH A NUMBER OF HYDRO UNITS EACH LESS THAN 50 MW. THE TOTAL CAPABILITY OF ALL THESE SMALL UNITS WAS ABOUT 610 MW OR ABOUT 30% OF THE TOTAL SYSTEM CAPABILITY

BY 1979 THE TOTAL NET CAPABILITY OF ALL THE SMALL UNITS (LESS THAN 50 MW) IS EXPECTED TO GROW SLIGHTLY TO ABOUT 650 MW, BUT THIS WILL THEN REPRESENT ONLY ABOUT 13% OF THE TOTAL SYSTEM CAPABILITY

The generation schedule to 1979, proposed by Calgary Power and agreed to by Edmonton Power, is presented in Figure III-2. From Table III-1, the Board notes that after 1975 the capacity reserve would vary from a high of about 28 per cent in 1976 to a low of 21 per cent in 1978. Consideration of these reserve margins as surplus capacity year by year to 1980 indicates that a 500 MW unit plus a 286 MW unit could be out of service and covered by the capacity reserve. The overall capacity factor for all the thermal plants is expected to range between 55 and 60 per cent in the late-Seventies, and would increase to about 70 per cent in 1975 if the largest unit then on the system, (286 MW), were out of service for the entire year. Assuming an even more drastic outage with both a Sundance 352 MW unit and a Clover Bar 171 MW unit out of service each year from 1977 to 1980 would result in an overall capacity factor for all the other thermal units barely exceeding the 70 per cent with a 286 MW unit out of service during 1975. The Board considers it reasonable to anticipate average operation of the thermal plants of an integrated system at an overall 65 to 70 per cent capacity factor under the assumed outage conditions. This provides some check on the suitability of the size of the units now proposed by Calgary Power and by Edmonton Power in their current applications.

Notwithstanding its respect for the experience and judgment of the respective applicants, the Board, recognizing the capital cost savings which could occur by installing larger units, would have liked to have seen a directly applicable quantitative analysis in support of the size and timing of additional units proposed by

FIGURE III-2



ALBERTA INTERCONNECTED SYSTEM
ANNUAL DEMAND AND GENERATING CAPABILITY
BASED ON 61% LOAD FACTOR IN 1970 INCREASING TO 65% IN 1980

Calgary Power and Edmonton Power. In particular, the Board would have been interested in seeing whether a single 500 megawatt unit, perhaps coupled with a gas turbine unit, might not have served the interconnected system better. For the time being however, the Board accepts the view of Calgary Power that operating experience with 500 megawatt units is not yet fully satisfactory and even if such a size did have theoretical advantages these could well be more than offset by operating problems. Such may not be the case by the time detailed consideration needs to be given to the next stage of expansion. The Board believes that the interconnected system is in a transition stage and by the late-Seventies the use of larger units will probably be justified.

The Board concludes that the 352 MW units now proposed by Calgary Power are of suitable size.

IV THE SUITABILITY OF THE CHOICE OF THE ENERGY RESOURCE AND THE ADEQUACY OF THE FUEL RESERVES

Views of the Applicant

The application for the addition of two new units to the Sundance Plant is based on the continued use of coal from the Highvale Mine in the South Wabamun coal field. The applicant submitted that numerous extensive investigations have been conducted into the feasibility of using other energy sources for the generation of electric energy including hydro, nuclear, oil and natural gas. Current capital cost for nuclear units, plus the large size of practical units led to the conclusion that nuclear stations were not feasible before 1980. Oil firing was eliminated on the basis of fuel cost.

As stated at the hearing, feasibility studies of many possible hydro and thermal sites had been conducted, and subsequent to the hearing, the Board received a list of these studies from Calgary Power. The indicated views of the applicant are set out below. Technically possible sites on the South Saskatchewan River system included Rapid Narrows, Eyremore, Shepard, Radnor and Russel. Technically possible on the North Saskatchewan River system were the Bighorn, Brazeau - Big Bend, Chambers Creek Diversion and Brazeau Forks sites. Technically possible on the Authabasca system were a number of sites from the Pembina River to Fort McMurray with an electric energy potential of about 60 per cent of the 1971 Provincial requirement. The Peace River has a technically feasible site at Dunvegan with a potential of about 30 per cent of the 1971 Provincial electric energy requirement. The most technically attractive site is at Smith Rapids, on the Slave River, a few miles upstream of the northern border of Alberta, but its use would entail excessively long transmission lines. This site may have a power potential equivalent to the entire 4-unit Sundance Plant.

Of the above feasibility studies, two have resulted in power development: the Big Bend development on the Brazeau River and the Bighorn development on the North Saskatchewan River. The Bighorn development was stated by the applicant to be the last economically feasible hydro development site in the southern half of Alberta. However, it appears that when the Bighorn development is completed in 1972, its capital cost will have escalated to perhaps twice the cost in dollars per KW of alternative thermal generation due to construction costs and its energy cost at the plant bus will be at least twice that quoted for the Sundance Plant. The applicant expects that hydro sites throughout the northern half of Alberta will also be very costly, and in addition will necessitate many miles of costly high voltage transmission. Calgary Power does not propose to develop any further hydro sites before 1980.

Calgary Power also reported on feasibility studies carried out for thermal plant sites in Elk Valley, in the Crowsnest Pass, to the west of Fort Macleod, near the Kananaskis Lakes, near Barrier Lake, at Canmore, near Calgary, south of Brooks, at Sheerness, near Red Deer, near Tofield, and at Genesee. Mine mouth and coal haul operations were considered at most of the sites, and a 4-unit (4-165MW) gas fired plant near Calgary was studied.

A present worth comparison of the most likely combinations of sites to 1978-79 was carried out in detail with ten possible combinations of plants: near Calgary, at Sheerness, at North Wabamun, and at Sundance. Gas and coal costs in cents per million Btu were assumed stable at 1970 prices (gas 20¢, coal 8 to 10¢) and the results favoured the Sundance site. Studies subsequent to the Sundance site decision have used a gas cost averaged over plant life at 31¢; and coal costs from 13 to 15¢ at Sundance and from 15 to 30¢ at other strip mine sites. The applicant has conducted coal drilling programs on a number of coal fields in the Province, resulting in the conclusion that, due to coal continuity and overburden stripping ratio, the South Wabamun coal field at the Sundance site is the most economical to mine.

The drilling program in the South Wabamun coal field has also provided data on available reserves and the applicant stated that some 213,000,000 tons of net mineable coal reserves have been proved by drilling, based on a mine recovery factor of 86 per cent and a maximum practical stripping limit of 140 feet. These strippable reserves are contained within an area averaging approximately one mile in width and ten miles in length. This calculation of coal reserves includes only that coal contained in two upper seams, each averaging ten feet in thickness, and does not include that coal contained in two lower, thinner seams. These lower seams average 1.5 and 2.4 feet in thickness, and each overlies a bentonitic footwall. The applicant stated that experience gained during the current year will determine whether or not there is a sizeable amount of mineable coal in these two thin, lower seams.

The strippable coal reserves in the South Wabamun coal field were determined over the past 11 years by the company in a program of exploratory and prove-up drilling within the coal field. This program consisted of the drilling of some 260 holes of which approximately 40 holes were cored. Coal core recovery in these holes was in the order of 90 to 95 per cent and the cored sections were sampled and analysed for coal quality. Additional sampling was carried out by hammer drilling along the subcrop and by further rotary prove-up drilling throughout the field. A typical analyses of the coal from the Highvale mine indicates a moisture content of 19.7 per cent, 16.7 per cent ash, 0.2 per cent sulphur, and an average heating value of 7,840 Btu per pound.

Calgary Power indicated that it has control of approximately 60 per cent of the coal reserves through Crown leases and ownership, and that it is negotiating with the owners of the remainder of the rights to mine. The company also indicated that it has control of 94 per cent of the surface rights necessary for the mining operation. The company informed the Board that no other markets currently exist for the coal from this field, and that Calgary Power has rights to other coal reserves, particularly those in the Ryley-Dodds-Tofield area, which, if necessary, could be moved to the Sundance site.

The applicant estimated that, with the addition of the two new units to the Sundance plant, the annual coal consumption would be approximately 6.1 million tons. This coal consumption is based on the applicant's contention that, because of the fuel economies to be realized in the South Wabamun coal field, the Sundance Plant will function as a high load factor (estimated at 82 per cent) operation continuously.

Views of the Interveners

Some of the interveners expressed concern about the disfiguration of the land surface by the mining operations. This matter is dealt with under Section VIII entitled "The Impact of the Proposal on the Environment".

Views of the Board

The Board agrees with the applicant that coal is the most satisfactory fuel to be used for the proposed addition to the Sundance Power Plant since the incremental cost of coal from the expanded mine is less than the cost of gas for such a base-load operation. The only available base-load hydro sites are too remote and too costly for development at this time.

The Board also accepts the net mineable coal reserve estimate of 213 million tons within the area outlined by the applicant. Assuming an average annual coal consumption of 6.1 million tons for the four units (existing and proposed) in the Sundance Plant, 60 per cent of these reserves, currently controlled by Calgary Power Ltd., would provide for a plant life of approximately 21 years. One hundred per cent acquisition of these reserves would provide for a plant life of approximately 35 years. The Board further agrees that the life of the Sundance Plant is not entirely dependent upon the total acquisition of coal reserves in the South Wabamun field, and that additional life-years could be gained by the use of coal from other fields. However, the Board understands that the applicant foresees no undue difficulties in obtaining total control of both surface and mineral rights in the mining area, and expects early conclusion of negotiations in order to provide an assembly of mineral and surface rights which will be amenable to an efficient mining operation.

Although it is expected that the mining operation and related land reclamation will be the subject of a subsequent application to the Board under a new Coal Conservation Act, the Board urges that, at this time, every effort be made to recover the coal from the two lower, thinner seams in the South Wabamun field.

V THE SUITABILITY OF PROVIDING THE INCREASED CAPACITY AT THE SUNDANCE SITE

Views of the Applicant

Calgary Power described how a number of hydro and thermal alternatives had been evaluated in arriving at the decision that the Sundance site was economically the most attractive alternative. One of the applicant's major loads is the City of Calgary, the load centre of the applicant's system is near Red Deer, and very little of the applicant's load is north of the Sundance site. These circumstances led to investigation of sites further south and also to various proposals to develop a new site further south and to alternative extensions between a plant in the south and at Sundance in such a way that transmission of base load energy would be minimized. For the latter reason, the development of hydro sites north of Lake Wabamun was considered premature even if development of such sites had not appeared very costly.

A gas-fired plant near Calgary was one of the alternatives seriously considered by Calgary Power before the decision was made to develop the Sundance site. However, coal was judged to be significantly cheaper than natural gas as long as the proposed plant required a large enough fuel supply. Calgary Power decided that the most economical development was that in which the Sundance site and mine were developed in consecutive stages to the final four-unit plant of 1,276 MW net and 1,350 MW gross.

Views of the Interveners

As noted previously, representatives of the residents and recreational groups from the Lake Wabamun area opposed any expansion at the present site.

The City of Calgary did not oppose the expansion of the Sundance site. It suggested that the Energy Resources Conservation Board might be interested in examining a copy of the City of Calgary's report entitled "Future Power Requirements of the City of Calgary Electric System" dated February 14, 1966. The City of Calgary also questioned the transmission plans of Calgary Power in connection with the Sundance site, but subsequently withdrew their statement.

Views of the Board

The Board notes the objections to the expansion on environment conservation grounds and deals with this in Section VIII of this report.

The Board agrees that, with the general cost and availability of coal at the Sundance site, and strictly from the viewpoint of economical generation of electric energy, the site is one of the preferred locations in Alberta. The Board also agrees with Calgary Power that the completion of the Sundance site to its ultimate capacity before starting a new thermal site is sound.

The Board notes that the proposal would result in the addition of capacity some 150 miles north of the geographic centre of the Calgary Power system load. This has advantages with respect to the northern portions of the interconnected system but some disadvantages relative to the southern areas of the Province. The Board accepts the contention of Calgary Power that the other advantages of the site, particularly the low cost fuel, more than offset any transmission cost disadvantages.

The Board concludes that the proposed location of the power plant expansion is satisfactory provided that environmental protection is adequate, as discussed in Section VIII.

VI THE ENERGY CONVERSION EFFICIENCY

Views of the Applicant

Calgary Power presented typical design data for the proposed units numbers 3 and 4 as follows:

Calgary Power Ltd. Sundance 750 MW Extension

Typical Energy Balance of Units 3 and 4 at Maximum Continuous Rating

		Heat Load 10^6 BTU/hour	Per Cent
1.	Coal: 871,000 lbs/hr @ HCV 7840 Btu/lb	6829	100.0
2.	Steam Generator Losses	1024	15.0
3.	Net Heat to turbine	5804	85.0
4.	Auxiliaries' Consumption (45 MW)	1536	2.3
5.	Net electrical output	2407	35.2
6.	Heat rejection to cooling water via condensers	3244	47.5
7.	Cooling water flow 2.165×10^8 lbs/hr @ 15 degrees Fahrenheit rise	3244	47.5

These proposed units would be tandem compound four-cylinder machines with regenerative feed heating. Inlet steam would be supplied to the turbine at a pressure of 2,350 psi and a temperature of 1000 degrees Fahrenheit, and reheat temperature would be 1000 degrees Fahrenheit. The condenser would operate at a vacuum of 28.5 inches of mercury if lakewater is used for cooling purposes.

Calgary Power also estimated that design figures for a 5000 psi (super critical) unit would show a heat rate with about a 10 per cent reduction in Btu/KWH compared with the proposed units' heat rate of approximately 9700 Btu/KWH. It further stated that such a gain would not be economically worthwhile unless the cost of fuel rose to about 37 cents per million Btu and, even then, the poor outage experience of super critical units would lead to the choice of a unit with lower pressure and efficiency. Calgary Power stated that units larger than 500 MW would still be designed with similar temperatures and pressures to those of the proposed units and therefore would experience similar efficiency.

Views of the Interveners

The City of Calgary expressed the opinion that advantage should be taken of any benefits of a 500 MW or larger unit but did not single out thermal efficiency as particularly significant. Canadian Utilities and Edmonton Power restricted their comments to statements that the proposed units complied with the requirements of the Reserve Sharing Agreement.

Views of the Board

The Board notes that the overall design efficiency of the generation of electric energy from fuel with the proposed units will be slightly better than 35 per cent. This corresponds to a thermal conversion of about 9700 Btu per Kilowatt-hour and is similar to that of the existing 286 MW units. The largest, most efficient power plants show thermal conversion design figures of about 8700 Btu per kilowatt-hour; but actual thermal conversion figures recorded with these plants in operation are between 9000 and 10,000 Btu per kilowatt-hour. The failure to attain design figures can be attributed to the effect of these units operating at loads different from their design ratings, to the use of fuels differing from those for which the boilers were designed, and to the addition of environmental protection devices.

In the past 50 years thermal conversion has improved from about 25,000 Btu per kilowatt hour to just under 9000 Btu per kilowatt hour. However, it has taken the last ten years to improve the thermal conversion from 10,000 to 9,000 Btu per kilowatt hour and present expectations are that another 30 years will be required before conventional fossil-fueled units can approach their theoretical limit of approximately 7000 Btu per kilowatt hour.

The Board concludes that units in the range of 1800 to 3000 psi and 1000 degrees Fahrenheit with reheat are the norm for the size of units proposed, and that the energy conversion efficiency of the proposed units is satisfactory having regard to present technology, reliability and the fuel.

VII THE RELATIONSHIP OF THE PROPOSED ADDITION TO THE EXISTING POWER PLANT

Views of the Applicant

The application of Calgary Power is, in part, for approval of an addition to the existing power plant. Calgary Power submitted that the additional two units proposed were logical expansions of the power plant and would allow the mine to be developed on a scale which would provide the most economical fuel for base load generation of electric energy. Information was furnished on the existing operation including a description of matters affecting the environment and a description of approvals obtained from other governmental agencies. In particular, a research project concerned with more efficient removal of flue-gas particulate matter has resulted in a decision by Calgary Power to replace the mechanical dust collector on unit No. 1 with an electrostatic precipitator at the same time as a similar precipitator is installed on unit No. 2, which latter unit is scheduled for completion in 1973. The proposed additional 2 units would discharge heated water from the plant through the discharge canal now used by the first unit. Alternative cooling schemes, as proposed by Calgary Power for the Sundance site, included all existing and proposed units of the 4-unit plant. Provincial fisheries biologists have expressed concern that the present discharge canal sets up a circulation of warm water which passes close by the whitefish spawning ground at the east end of the lake. Calgary

Power also stated that the investment in sluicing equipment for the present two units effectively committed Calgary Power to wet handling of the ash as opposed to dry handling, for the proposed two unit extension.

Views of the Interveners

The interveners who were part time or full time residents of the Wabamun area consistently objected to what they believe to be the effect on the environment of the present installation on Lake Wabamun, and their view of the relationship to the proposed extension was that any increase in these effects on the environment would be intolerable.

Views of the Board

In view of the close relationship between the subject of the application, the proposed addition of units No. 3 and 4, and the existing Sundance power plant, and having regard to the advice of the Department of the Environment, the Board believes it proper to consider a single approval covering both the existing plant and the addition. This would be compatible with the provisions of the Act, and would allow the incorporation of conditions suitable for ensuring that the entire operation at the Sundance site conform with the appropriate standards related to environmental control. Noting the obvious concern of residents of the area with respect to the existing operation and also the Board's own decision as reported in ERCB Report

71-C-HE (1) in connection with the Battle River application, the Board believes it proper to require that the existing facilities be suitably modified to meet environmental standards within a reasonable period of time.

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(1) In the Matter of an Application of Canadian Utilities, Limited for Approval of the Construction and Operation of an Addition to the Battle River Power Plant, and for an Order for its Interconnection, 1971.

VIII THE IMPACT OF THE PROPOSAL ON THE ENVIRONMENT

Atmosphere

The principal effects of the operation of the previously approved Sundance power plant and the additional two proposed units on the atmosphere would be those associated with the discharge of sulphur dioxide, oxides of nitrogen and particulate matter, all derived from the combustion of the coal fuel.

(1) Relevant Provincial Standards

The standards of the Department of the Environment relate both to the emission of the pollutants and to the actual ground-level concentrations.

With respect to the permissible emissions of gaseous pollutants, the Department expresses the maximum permissible quantities in terms of the calculated ground level concentration resulting from the discharge of the expected pollutants through a stack of prescribed height. The standards require that the calculated ground level half-hour average concentration of sulphur dioxide in agricultural and urban areas not exceed 0.20 parts per million. With respect to oxides of nitrogen the standards prescribe that the calculated ground level maximum half-hour average concentration expressed as nitrogen dioxide not exceed 0.30 parts per million in rural areas and 0.20 parts per million in urban areas.

The current Provincial emission standard with respect to the discharge to the atmosphere of dust or particulate matter requires that the concentration of particulates in effluents to the atmosphere resulting from combustion of fuels shall not exceed 0.85 pounds per 1,000 pounds of effluent, adjusted to 50 per cent excess air for products of combustion. The Department has indicated this standard may be made more stringent in the future.

The ground-level concentration standards of the Department are expressed in the publication "Ambient Air Quality Standards" issued by the Environmental Health Division of the Department of Health in September, 1970. These limit actual ground-level concentrations of sulphur dioxide to 0.30 parts per million averaged over one hour and to 0.10 parts per million averaged over 24 hours. Actual ground-level concentrations of total oxides of nitrogen, expressed as nitrogen dioxide, are also limited to 0.30 parts per million averaged over one hour and to 0.10 parts per million averaged over 24 hours.

Total dust fall is limited to 15 tons per square mile per 30 days in residential areas and 45 tons per square mile per 30 days in industrial and commercial areas with due allowance made for background levels.

(2) Views of the Applicant

Calgary Power stated that the combustion gases from Units 3 and 4 would be exhausted to the atmosphere through a single stack 26.5 feet in diameter serving both units. The stack would be identical to that used for Units 1 and 2 and would be 510 feet in height.

The applicant stated that the sulphur content of the coal to be used as fuel is very low and averages approximately 0.2 per cent by weight. The sulphur dioxide emission for Units 3 and 4 at maximum continuous rating with a coal consumption of 882,900 pounds per hour would be approximately 42 tons per day. Instantaneous emission rates could be somewhat higher as concentrations of sulphur in the coal as high as 0.5 per cent have been detected. Since these higher concentrations occur infrequently and since considerable mixing of the coal takes place in the coal piles before combustion, Calgary Power stated that it did not believe that the emission rate over a one-hour period would exceed 55 tons per day.

Measurements of the stack gas composition of the existing Unit 1 indicated sulphur dioxide concentrations of less than 200 parts per million and oxides of nitrogen concentrations, expressed as nitrogen dioxide, of less than 250 parts per million. Calgary Power stated that, because some variations in the coal quality may be experienced and in order to be conservative, it assumed a stack gas sulphur dioxide and nitrogen dioxide concentration of 300 parts per million for the purpose of calculating maximum ground level sulphur dioxide and nitrogen dioxide concentrations from Units 1, 2, 3 and 4. The calculations indicated concentrations averaged over one-half hour of sulphur dioxide and nitrogen oxides, expressed as nitrogen dioxide, not exceeding 0.026 parts per million at ground level, much less than the Provincial standards for both gases of 0.20 parts per million averaged over one-half hour in urban areas.

Calgary Power stated that it had not considered sulphur dioxide stack gas clean-up processes for reduction of the sulphur dioxide emission rate since in its opinion most of these processes are still in early development stages. The applicant stated that it had started a study of oxides of nitrogen emission control but stated that it was still in very preliminary stages.

Dealing with particulate emissions Calgary Power stated that it had begun a research program in 1970 coincidently with the start-up of Sundance Unit 1 to determine what means might be used to reduce particulate emissions from the stack. On the basis of tests using a pilot electrostatic precipitator it has decided to equip Unit 2 with an electrostatic precipitator, and simultaneously to replace the mechanical dust collector now serving Unit 1 with an identical unit. Similar precipitators would be installed with Units 3 and 4. These units are expected to cost a total of $16,000,000. Calgary Power expressed the expectation that the precipitators will be capable of removing between 99.0 and 99.5 per cent of the particulate matter from the stack gases. The dust loading at the discharge of the precipitators is expected to be equal to or less than 0.09 pounds per 1,000 pounds of stack gas, an order of magnitude less than the concentration of 0.85 pounds per 1,000 pounds now permitted by the Provincial standards. Calgary Power stated that at this dust loading little or no plume from the stacks would be visible except during cold weather when water vapour contained in the stack gases would be condensed.

The applicant stated that it proposed to determine continuously the particulate concentration of the stack gases to provide for continuous monitoring of any deterioration in the performance of the precipitators. In the event of a major precipitator failure the station load would be reduced to ensure that all flue gases would pass through an operating precipitation unit.

Calgary Power did not comment on concern expressed by an intervener that the discharge of fly ash to the atmosphere could cause silicosis due to the 50 per cent concentration of silica in the ash.

With regard to the monitoring of air pollutant concentrations in the vicinity of the plant Calgary Power stated that it has operated five dust fall collectors in the area south and west of the plant since 1970. The monitoring had indicated high background dust fall levels in the summer. Calgary Power stated that winter observations indicate dust fall levels of 1 to 3 tons per square mile per month while summer dust fall levels were as high as 69 tons per square mile per month. It attributed the high summer readings to dust from other sources, such as automobile traffic. The applicant stated it also operates dust fall stations east and north of the Sundance plant but these are associated with its Wabamun plant operation.

Calgary Power stated that it has not monitored other atmospheric pollutant concentrations because of low predicted values but would be prepared to expand the monitoring network if it was necessary to do so.

(3) Views of A. H. Nash, J. Paron, A. W. Hardy, P. and H. J. Coflin and J. E. Sydie

The interveners A. H. Nash, J. Paron, A. W. Hardy, P. and H. J. Coflin and J. E. Sydie were not represented at the hearing. Mr. J. Paron specifically referred in his letter to the observance of pollution in the smoke plume emitted at the top of the power plant stacks. Mr. J. E. Sydie, who has been familiar with Lake Wabamun since 1919, referred to the effects of fly ash and noxious gases on the summer Village of

Point Alison and the deplorable condition now existing due to stack emissions affecting the summer Village of Kapasiwin.

(4) Views of Canadian Utilities, Edmonton Power, The City of Calgary, The City of Lethbridge and G. K. Wynn

Though represented at the hearing, these interveners did not express views on the effect the plant would have on the atmospheric environment.

(5) Views of the Wabamun Sailing Club, P. H. Carpenter, L. Thomas, A. D. McTavish, G. L. Roper, Summer Village of Kapasiwin and M. X. M. Coughlan

The Wabamun Sailing Club expressed general concern with contamination of the atmosphere by the plant.

P. H. Carpenter expressed fear that the emission of up to 55 tons per day of sulphur dioxide to the atmosphere from the proposed extension could have deleterious effects. He referred to the nuisance caused by dust fall which appears on cottages, car tops and boats which he attributed to the discharge of particulate matter from the Sundance and Wabamun plants.

L. G. Thomas stated he was concerned with the prospect of an addition to the smoke nuisance implicit with extension of the plant. He referred to dust deposits which appear both indoors and out and which were not present before the plant went into operation.

A. D. McTavish expressed concern that additional emissions of fumes and ash would cause ecological and visual damage to the area surrounding the plant and recommended that appropriate action be taken to ensure that the environmental damage arising from the emission of fumes be minimized.

Dr. N. F. Duncan for the Summer Village of Kapasiwin, referred to the nuisance caused by the deposition of dust caused by particulate emissions from the plant.

Dr. M. X. M. Coughlan expressed concern with total quantities of sulphur dioxide, oxides of nitrogen and particulate matter to be emitted to the atmosphere. He stated these emissions would have a detrimental effect on the health and psychology of the inhabitants of the area. He expressed concern that these emissions could also damage plant life and property. He quoted monitored annual mean pollutant concentrations measured in polluted cities in the United States where, in his opinion, annual mean concentrations were much below Alberta allowable levels and yet pollution problems existed. He expressed concern that hydrocarbons emitted to the atmosphere would form ozone and other oxidants. Dr. Coughlan expressed concern that the additive effects of emissions from the Wabamun and Sundance plants could result in unacceptable pollutant concentrations. He also stated that possible synergistic effects of the pollutants emitted could be detrimental. Dr. Coughlan further stated that silicosis could be caused by inhaling silica particles emitted from the stacks since the applicant indicated the particulate matter emitted would contain approximately 50 per cent silica.

(6) Views of the Board

Board calculations of ground level concentrations of sulphur dioxide and oxides of nitrogen using the basic data submitted by the applicant, generally confirm the applicant's calculations and indicate that the combined effect of emissions from the existing stack (Units 1 and 2) and the proposed stack (Units 3 and 4) would result in maximum one-half hour average concentrations of each of sulphur dioxide and oxides of nitrogen of 0.057 parts per million, considerably less than the applicable standard of the Department. The Board notes that short-term sulphur dioxide emission rates could be as much as 2½ times the average rate due to variation in the quality of the coal but that even at this higher rate the calculated maximum half-hour ground level sulphur dioxide concentration of 0.14 parts per million would not exceed the standard of 0.20 parts per million. Board estimates of the oxides of nitrogen emission rates also generally confirm those submitted by the applicant.

Since the calculated maximum ground level concentrations of sulphur dioxide and oxides of nitrogen are well within Provincial standards, the emissions of these substances from the plant stacks should not have any detrimental effect on the health of plants, animals or humans in the vicinity of the generating station. The standards were established at concentrations for which there is no evidence of damage to plant, animal or human life occurring.

The Board is of the opinion that installation of the electrostatic precipitators proposed by the applicant is desirable and would reduce the particulate concentration of the stack gases to a fully acceptable level well below present or probable future standards. Control of particulate emissions in this manner should essentially eliminate any effect of the power plant on dust levels in the Lake Wabamun area.

The Board is generally satisfied with the offsite dust fall monitoring now being conducted by the applicant, but it is of the opinion that sulphation monitoring is also required to indicate any effect the sulphur dioxide emissions may be having on total sulphation levels in the area.

Regarding the concern expressed by Dr. Coughlan that pollutant concentrations in the area would exceed those in heavily industrialized cities in the United States, the Board has examined the Continuous Air Monitoring Program Data for 1964[1] for the cities in question and notes maximum daily average concentrations of sulphur dioxide, nitric oxide, nitrogen dioxide and total oxidants of 0.68, 0.45, 0.26 and 0.15 parts per million respectively. These levels are very much in excess of those predicted for operation of the Sundance plant for one-half hour averaging periods. Maximum daily average concentrations at Lake Wabamun would be considerably lower than the predicted maximum one-half hour average concentrations.

The Board is of the opinion that photochemical smog would not become a problem in the area due to atmospheric reactions between oxides of nitrogen emitted from the plant and hydrocarbon vapours emitted from passing automobiles. The quantities of reactive hydrocarbons and of oxides of nitrogen in the atmosphere would be considerably less than that present in industrialized cities which do have photochemical smog problems and in the opinion of the Board insignificant quantities of ozone and other oxidants would be formed.

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[1] Air Pollution; A. C. Stern; Second Edition; Volume 1; Air Pollution and Its Effects; 1968; Academic Press; p 33.

Board staff have evaluated the aggregate effect of emissions from the Sundance and Wabamun power plants on pollutant concentrations in the area and have determined that calculated maximum concentrations of sulphur dioxide and oxides of nitrogen would not exceed the Provincial standards.

Regarding the concern that silicosis could be caused by inhaling silica or silica-containing particles emitted from the stacks, Board staff have estimated the maximum atmospheric particle density that would result due to particulate emissions from the plant. Using a stack gas particulate concentration of 0.05 grains per cubic foot and assuming a mean particle diameter of 2.5 microns, as submitted by the applicant, Board staff calculated a maximum one-half-hour average concentration of silica particles at ground level of approximately 8,000 particles per cubic foot of air. This concentration is very far below the criterion of 5,000,000 particles per cubic foot of air stated by Dr. Coughlan to be an allowable concentration. Based on this estimate, the Board does not believe any silicosis hazard could result from the operation of the plant.

The Board concludes that the measures proposed by Calgary Power for the control of air pollution are generally satisfactory.

Should an approval be issued for the plant, the Board believes that it would be appropriate to express the pollutant emission restrictions directly in terms of the maximum number of tons per day of each pollutant rather than indirectly through calculated ground-level concentrations or quantities of dust per quantity of total effluent. Further, for its approvals of gas plant operations, the Board has adopted restrictions on actual ground level concentrations of sulphur dioxide equivalent to the Department's calculated concentrations and more stringent than the present Provincial Ambient Air Quality Standards. The Board believes it proper that any approval issued for the plant contain conditions requiring that actual ground-level concentrations of sulphur dioxide and oxides of nitrogen not exceed the stricter of these two standards.

Water

Several features of the operation of the present and the proposed units affect or could affect Lake Wabamun. Probably the most important is the possible effect on the fish and plant life of the lake due to the temperature increase caused by the cycling of power plant cooling water. Additional matters of concern are the return to the lake of the overflow water from the ash disposal ponds, the return to the lake of water treatment regeneration solutions, boiler blow down and oily or other waste solutions, and the possible discharge or escape to the lake of drainage water from coal storage piles.

(1) Relevant Provincial Standards

The standards prescribed by the Department are set forth in the publication "Surface Water Quality Criteria" issued by the Environmental Health Division, Alberta Department of Health, August, 1970. The prime considerations respecting this application are the temperature rise resulting from the circulation of cooling water, the pH of the water returned to the reservoir and possible oil spills.

With respect to the temperature rise above the ambient water temperature, the standards require that this not exceed 3 Centigrade degrees (5.4 Fahrenheit degrees). The standards require the pH to be in the range of 6.5 to 9.5 and not altered by more than 0.5 pH units from background value, and that oils and grease be substantially absent. With reference to the specific water quality objectives the publication states that the standards are for evaluation of conditions except in close prosimity to outfalls as prescribed by the Provincial Board of Health (whose functions in this area are being carried forward by the Division of Standards and Approvals of the Department of the Environment).

(2) Views of the Applicant

Calgary Power explained that the principal use of water in the plant is for condenser cooling. This water is untreated and is returned to the lake unchanged except for the addition of heat. The design of the condensers for the proposed Units 3 and 4 would be similar to that of the first two units. Since little or no cooling would occur along the 3,000-foot length of the discharge canal, the temperature of the water returned to the lake would be above the criterion and approximately 15 Fahrenheit degrees warmer than the ambient lake water temperature. Calgary Power stated that as this warmer water reached the cooler water of the lake some mixing would occur; however, most of the warm water would rise to the surface layers of the lake and transfer heat to the atmosphere. The extent of mixing and the area and shape of the thermal dispersion plume would be affected primarily by the strength and direction of surface winds. Calgary Power stated that in general its observations indicate that approximately 1,000 feet beyond the out fall of the discharge canal, stratification of the warm discharge water and the cooler lake water is complete and through the major part of the water depth, below the warm surface layer, the water is at temperatures which meet the criterion. Calgary Power stated that there does not appear to be any likelihood that the thermal dispersion plumes of the discharge from the Sundance and Wabamun plants would meet each other.

Calgary Power made several comments about the weed growth in the lake which was a matter of concern of the local residents and cottagers. It stated that in an interim report, a task force, composed of the people who have been carrying out the various research projects within the lake, stated that the normal biochemical eutrophication is accelerating in Lake Wabamun but has not identified a singular cause. The task force recommended further research, and Calgary Power plans to co-operate actively with it in this research. Calgary Power stated it would take action to reduce heat addition to the lake if this research should eventually show that the addition of heat has a significant detrimental effect on the recreational value or the ecology of Lake Wabamun.

Calgary Power presented descriptions of several methods of reducing the temperature of the cooling water returned to the lake. The most elaborate system, which would eliminate the need for the discharge of heated cooling water to the lake, would be the installation of mechanical draft air coolers, but the capital cost for this installation is estimated to be in the order of $21,000,000. Calgary Power stated that, until it is convinced that the addition of heat to the lake is the cause of the excessive weed growth, it is of the opinion that it would be unwise to go to the expense necessary to reduce or eliminate the heat input to the lake. It stated that money would be more wisely spent on some more direct weed control method.

Calgary Power said it has studied the possible use of herbicides and the use of weed cutters as control methods. It is of the opinion that either method could effectively reduce the weed problem.

The applicant stated that in its opinion the rate of weed growth is proportional to hours of sunlight and inversely proportional to the lake water level. It stated that its operations have not lowered lake levels significantly and submitted records of the water levels in Lake Wabamun and Lac

Ste. Anne and data on precipitation in Edmonton since 1940. The applicant stated that the Lake Wabamun water level has fluctuated in a manner much the same as the Lac Ste. Anne water level and that both have fluctuated with total precipitation. Calgary Power stated it estimates evaporation due to power plant heat input to the lake to result in the loss of 4 inches of lake water per year but that lake level records show that this water is replaced naturally and no cumulative loss occurs. It estimated natural evaporative losses to be equivalent to 36 inches of lake level per year.

Calgary Power submitted aerial photographs of the east end of the lake taken annually since 1962. The photographs show the most extensive weed growth to occur in the vicinity of the power plant out falls, which Calgary Power stated to be the most shallow part of the lake and one of the few areas with a rich fertile bottom sediment.

The greater volume of liquids conveyed to the ash lagoon would contain the residual ash from the boiler grates. Sufficient storage would be provided for ash and other solids to settle out, so that only the clear water effluent would be released to the lake. Calgary Power stated that the alkalinity of the water would be neutralized naturally through contact with the acidic ground on which the lagoon is located and through absorption of carbon dioxide from the atmosphere at the lagoon water surface. Calgary Power stated that the total solids content of the ash lagoon overflow water is of comparable quality to the input water.

The applicant stated that other methods of ash disposal such as dry hauling could be used but are not attractive at the present time because of the approximately $1,000,000 additional capital investment that would be required.

With regard to the disposal of boiler blow down water, Calgary Power stated that boiler blow down would be directed to the ash lagoon where precipitation of solids would occur before the lagoon overflow water discharges to the lake. Water treatment chemicals from the hot lime and sodium zeolite softeners also would flow to the ash lagoon for retention and settling before discharge to the lake.

Wastes resulting from periodic chemical cleaning of boilers would also be discharged to the ash lagoon. While this operation is in progress, effluent from the lagoon would be suspended for a number of hours until the pH of the water in the lagoon stabilized at an acceptable level.

The applicant stated that it did not believe that run-off from the coal piles would contaminate the lake. It stated that this run-off would be essentially identical to run-off from the mine and that no adverse effects have been observed to date.

(3) Views of A. H. Nash, J. Paron, A. W. Hardy, P. and H. J. Coflin and J. E. Sydie

The interveners A. H. Nash, J. Paron, A. W. Hardy, P. and H. J. Coflin and J. E. Sydie were not represented at the hearing, however, the documents filed by each of these interveners expressed concern with the effect the plant extension would have on Lake Wabamun.

A. H. Nash, who has owned a cottage on Kapasiwin Beach for 25 years, submitted that in recent years he was no longer able to enjoy his beach because he spent many hours cleaning up the weeds in order to make it habitable, and that he was unable to use the lake for skating as in the past because of the open water created by the return of the warm water to the lake from the power plants. J. Paron submitted that during the seven years he has owned a cottage on the lake the weed growth had increased.

Dr. Hardy, who has been a cottage owner in the Village of Point Alison for 22 years, submitted that the weed growth in the east end of the lake was a recent phenomenon. He suggested that while there could be other factors contributing to the weed growth, in his opinion the heat returned from the power plant was the most important.

P. and H. J. Coflin in their submission stressed the impact of the power plant on the recreational and commercial fishing aspects of the lake. They also suggested that while there could be other factors contributing to the environmental impact the lake had deteriorated accordingly as the size and capacity of the power plants had increased.

The submission of J. E. Sydie stated that since the Wabamun power plant had been built weed infestation had increased and appeared on portions of the lake never before affected, the lake had been closed for commercial white fish fishing, and water levels had become more erratic. He considered that any further plant expansion would grossly accentuate all of the conditions mentioned.

(4) Views of Canadian Utilities, Edmonton Power, The City of Calgary and the City of Lethbridge

Canadian Utilities, Edmonton Power, The City of Calgary and The City of Lethbridge, though represented at the hearing, did not express a view on the effect the plant would have on Lake Wabamun.

(5) Views of the Wabamun Sailing Club, P. H. Carpenter, L. G. Thomas, A. D. McTavish, G. L. Roper, Summer Village of Kapasiwin, M. X. M. Coughlan and G. K. Wynn

Concern for the effect the plant would have on Lake Wabamun was expressed by the Wabamun Sailing Club, P. H. Carpenter, L. G. Thomas, A. D. McTavish, the Summer Village of Kapasiwin, M. X. M. Coughlan and G. K. Wynn.

The Wabamun Sailing Club stated that in its opinion the thermal discharge from the power plants is having a stimulating effect on the growth of weeds in the lake and that the addition of further units to the plant would cause irreparable harm. It stated that excessive weed growth is both a nuisance and a hazard to the safety of boaters using the lake. In its opinion the weed growth has been progressive with some cycling due to changes in the lake water levels. It stated that Calgary Power should be required to prove beyond a doubt that the effluent from the plant does not significantly affect the ecology of the lake before approval of any extension is granted.

P. H. Carpenter expressed concern regarding the deterioration of the quality of the lake due to the heavy weed growth which has become apparent in recent years. He stated that the problem has been most severe in the immediate vicinity of plant out falls and in areas where the lake is kept open all winter by the heated water discharged from the power plants.

L. G. Thomas expressed his concern regarding changes he said have overtaken the lake in the years since Calgary Power began development in the area. He stated that, in his opinion, the increase in weed growth coincided with the discharge of hot water from the Wabamun plant directly into the lake.

A. D. McTavish stated that the major problems at Lake Wabamun have been low water levels and excessive weed growth. He stated that lake water levels have decreased due to increased evaporation from the lake caused by the addition of heat from the power plants and from the fact that part of the lake is now kept ice free year round. Mr. McTavish recommended that the present application not be approved unless facilities are provided to add to the lake at least as much water as is lost through evaporation due to the operation of the power plants.

Mr. McTavish stated that weed growth increased greatly with start-up of the Wabamun plant and has now rendered much of the east end of the lake virtually useless for recreational purposes. He expressed the opinion that heat input to the lake and lower lake levels have been the most significant factors contributing to this excessive weed growth. He recommended that approval not be given for the proposed power plant extension until appropriate actions to eliminate the weed growth problem have been taken and found effective.

N. F. Duncan, appearing for the Summer Village of Kapasiwin, expressed concern regarding excess weed growth which he stated is most prevalent in the area of the hot water effluent from the Wabamun plant. In his opinion the excessive weed growth has been due to warming of the lake water by the power plant effluent and removal of the winter ice cover. Dr. Duncan questioned the suitability of the water temperature standard of the Department. He recommended that if the Board grant approval of the application it should impose the condition that Calgary Power accept the final outcome of the task force study and make any modification in its operations necessary to maintain the ecological balance of the lake.

M. X. M. Coughlan expressed concern that the temperature of the lake would increase which would in turn increase the growth of plant life in the water to the extent that the lake could become unsuitable for recreational purposes. He attributed the cause of present excessive weed growth to the thermal discharge from the existing power plants.

G. K. Wynn also expressed concern regarding the extension of the Sundance plant and the addition of more heated water to the lake which could further accelerate weed growth and the problems associated with it. He suggested that the applicant be required to take immediate corrective steps on the existing plants to stop the present thermal pollution before it is allowed to proceed with installation of any additional facilities.

(6) Views of the Board

The importance attached by the Government of Alberta to the recreational value of Lake Wabamun is emphasized by a news release of March 7, 1972, by the Honourable Mr. Yurko, Minister of the Environment, referring to "the preservation of Lake Wabamun as a major recreation area and to maintain the water quality and lake environment at a high standard". The Board recognizes that the warming of a body of water by the discharge to it of process heat may have adverse environmental effects. The criterion established by the Department defining the maximum acceptable temperature rise is no doubt a suitable one under certain circumstances, but the Board does not believe it is suitable for the kind of situation which now exists at Lake Wabamun.

Calgary Power accepts that the return of heated water from the Wabamun and the Sundance power plants may have had and may continue to have an influence on the growth of weeds in the lake; the interveners who expressed themselves on the matter, for the most part, were convinced that the weed problem was caused by the return of heated water. There is no doubt that additional evaporation of lake water results from the addition of waste heat to the lake and this must have an adverse effect on the water level in the lake at least at certain times of the year.

The Board recognizes that there is less than absolute proof that the discharge of warm water into the lake has caused accelerated and spreading growth of weeds in the lake but it agrees with many of the interveners that it would be improper to await the results of the studies required to establish the cause with complete certainty. The circumstantial evidence of

(a) the approximate coincidence of accelerated weed growth with the start of operation of the Wabamun plant, and

(b) the approximate coincidence of the areas of accelerated weed growth with the areas covered by thermal plumes created by the Wabamun and the Sundance plants,

is convincing to the Board. Further, the Board accepts the conclusions of Mr. E. Dale Allen and Dr. P. R. Gorham of the Department of Botany of the University of Alberta (page 45 of Report, Wabamun Lake Thermal Project Interdisciplinary Program, 1971, The Effect of the Modified Temperature Regime on the Biota of Lake Wabamun, Alberta, Dr. D. N. Gallop, Editor) that, "From observations over the past three years, we conclude that the thermal effluent from the power plants tends to increase the rate of growth and alter species dominance of submerged macrophytes very significantly. Moreover, it causes these macrophytes to break the dormancy earlier and mature earlier than their counterparts in cooler water. This, in turn, results in early genescence and breakdown which, when severe enough, can cause them to break off and form floating weed masses." This report was referred to at the hearing and a copy was obtained subsequently by the Board.

On the evidence of Calgary Power, the capital cost of providing alternative cooling facilities to eliminate heat rejection to the lake and to provide make-up water to compensate for evaporation losses would be of the order of $20 million for the fully developed Sundance plant Units 1, 2, 3 and 4. On normal accounting and for the anticipated plant capacity factor of 82 per cent, the Board estimates this would amount to, before taxes, some one-half mil per kilowatt hour of energy generated or an increase of about 10 per cent in the generation cost at the site. The relative cost impact on the ultimate consumer of the energy would be somewhat less. Bearing in mind the important recreational use of the lake, the Board believes that, if such expenditures prove necessary, their cost would be a proper element in the total cost of generating the electric energy and one which should be borne by the consumers of the energy.

The Board concludes that if an approval is to be given for the proposed expansion of the Sundance plant, it should be subject to the conditions that

(1) Calgary Power submit for the further approval of the Department of the Environment and the Board detailed plans for providing alternative cooling facilities for Units 1 and 2 which would completely eliminate heat rejection to the lake from the units, the facilities to be installed as soon as practicable, and

(2) unless Calgary Power satisfies the Department and the Board by October 31, 1974, that

  (a) the discharge of waste heat associated with Units 3 and 4 to the lake, and

  (b) the lack of make-up of any water used from the lake in connection with the operations of Units 1, 2, 3 and 4, do not, and shall not, contribute significantly to the growth or spreading of the weeds in the lake, or to other deleterious effects in the lake, then Calgary Power be required to submit for the further approval of the Department of the Environment and the Board detailed plans for providing either or both, as the case may be

(c) alternative cooling facilities for Units 3 and 4 which would completely eliminate heat rejection to the lake from the units, or

(d) if the facilities provided for Units 1 and 2 or proposed for 3 and 4 involve the use of lake water, facilities for the make-up of any water so used;

the facilities to be installed prior to the start-up of Units 3 and 4.

The Board also believes that any approval issued should be conditional on the institution in 1972 of an effective weed cutting and harvesting program for the entire eastern end of the lake to be continued for such time as the Department of the Environment may require.

The Wabamun plant is not the subject of the present application and will be reviewed by the Board at a later date.

With respect to the disposal of ash, the Board recognizes that the water slurrying and ponding technique is one which is widely used and free of many of the problems of handling fine ash in dry form. The Board understands, however, that the Department has reservations concerning this disposal method, being of the opinion that the water returned to the lake could contain contaminants. The Board appreciates the concern of the Department and agrees that the proposed ash disposal method should be subject to further investigation. The requirement to conduct and report on such an investigation should be a condition of any approval issued.

Since the applicant proposed to dispose of boiler blowdown, spent regeneration chemicals and wastes from chemical cleaning in the ash lagoon, the Board is of the opinion that the disposal method for these materials should also be investigated and reported on. The Board would also require in any approval issued that the applicant review methods of containing drainage water from the coal piles since it would appear that these waters could be confined with little difficulty to ensure that contamination of the lake from this source does not occur. Since the applicant did not comment on the disposal of oily wastes and on precautions to be taken in the storage of oil and chemicals where the escape of such materials from storage could cause a problem, the Board believes that precautions to be taken in this regard should also be reviewed and reported on.

The proposal of the applicant for the disposal of sanitary wastes appears to be generally satisfactory.

Land

The principal feature of the operation of the present and proposed future facility which has or could have an effect on the land is the method used to mine the coal reserves and the extent to which reclamation is carried out in the mined areas. The Board anticipates that it will be conducting an early review of the coal mining operation in pursuance of its responsibilities under The Energy Resources Conservation Act, The Coal Mines Regulation Act and a proposed new Coal Conservation Act. Detailed conditions applicable to the operation will be established at that time. Since the matter was discussed at the hearing of the application however, the views of the applicant and the interveners and the present general view of the Board are given.

(1) Views of the Applicant

Calgary Power stated that reclamation of the mined land has been studied and carried out since the beginning of its mining operations in the Whitewood mine, serving the Wabamun generating station. Mining of the Whitewood mine commenced in 1962. The applicant stated that in 1963 an area of approximately five acres was planted with various mixtures of seed as an experiment. Six varieties of grasses and legumes and some 300 seedling trees of 10 different varieties were planted. Initial results were poor and in 1966 a second experimental area of 30 acres was prepared in the mined out area. Encouraging results were obtained with alfalfa, honeysuckle and willow. Based on these results, Calgary Power stated it contoured and seeded 150 acres in 1969 and 200 acres in 1971. Calgary Power stated that the area now mined out is approximately

600 acres, approximately 400 acres of which have been reclaimed in the manner described. Much of the reclamation has been relatively recent and hence has just begun to show results.

Mining of the Highvale mine, servicing the Sundance plant, commenced in 1970. Calgary Power stated that reclamation of the Highvale mine will commence as soon as sufficient mined out area and working room is available.

(2) Views of the Interveners

Three of the interveners expressed concern about disfiguration of the land surface by the mining operation.

P. and H. J. Coflin expressed concern in their written submission for the scarred landscape resulting from the strip mining operations.

The Wabamun Sailing Club also expressed general concern about reclamation of the mine area.

A. D. McTavish, appearing for himself and G. L. Roper, stated that in his opinion reclamation has been inadequate and has proceeded much too slowly. He stated that additional mining would further reduce the attractiveness of the area, cause additional damage to vegetation, affect natural water drainage into the lake and generally adversely affect the ecology of the lake and its surroundings.

(3) Views of the Board

The Board is of the general opinion that through operation of its Whitewood mine, the applicant has demonstrated its willingness to reclaim mined out areas to an acceptable standard without undue delay. While some time was required to begin full reclamation in the Whitewood mine, the Board believes that this delay was justified since active experimentation was taking place at the time. The Board has inspected the reclamation at the Whitewood mine and does not agree with the criticism of some of the interveners and on the contrary believes that Calgary Power is to be commended for its reclamation program.

The Board has no reason to believe that satisfactory reclamation will not take place in the Highvale mine.

IX THE ADEQUACY OF PRESENT PLANNING FOR THE EXPANSION OF ELECTRIC GENERATION AND TRANSMISSION FACILITIES IN ALBERTA

Views of the Applicant

The applicant stated that the electric generation and transmission systems in the Province are physically interconnected and operate in synchronism at all times. This meant joint operation and mutual aid in times of trouble. Expanding on this feature the applicant submitted that the co-operation had been so effective that there had never been a "brown-out" in the Province even though each system had been in difficulty at one time or another by itself.

Calgary Power indicated that planning for expansion was carried out, more or less, on an informal basis. It stated that the Reserve Sharing Agreement which involves the three principal electric generating utilities; Calgary Power, Canadian Utilities and Edmonton Power and has been in effect since 1969, is a more formal expression of the basis for planning. According to the applicant the actual planning process leading to the present proposal consisted mainly of continuous communication between the three generating utilities with each keeping the others informed at each stage of development.

Calgary Power stated that discussions involving exchange of information between the three generating utilities regarding each other's plans, had been intensive enough to achieve all the results that would accrue to formal joint planning. The applicant further stated that the joint co-operative planning of plants and main transmission lines had been such that it was unlikely that actual facilities would have been much different than they were at the present if they had been under one management. The applicant's final comment on this subject was that the joint operation and planning of the systems would continue to meet the requirements of the interconnected systems.

Views of the Interveners

(1) City of Edmonton

Edmonton Power submitted that the proposed plant additions were known to the joint committee of the three generating utilities who are parties to the Reserve Sharing Agreement, and that the installation would provide a suitable level of generating reserve capacity to serve the public interest. Edmonton Power did not make any comment on the adequacy of present planning.

(2) City of Calgary

The City of Calgary stated that, "As the largest non-generating electrical utility in the Province, the City of Calgary proposes to initiate and to participate fully in the investigation of the practicability of a joint venture for the generation of electric energy in Alberta. We urge the Board to endorse the concept of such a joint venture so that planning may commence immediately as it must if such an undertaking is to be ready to meet the electric demands of the Province by 1978."

The City of Calgary said it based its statement on the fact that given the power plants, for approval of which Calgary Power and Edmonton Power were applying, the generation requirements of the interconnected system would be met up to the year 1978, but by then the major generating utilities in Alberta must have under construction the plant or plants to handle the next phase of load growth of the Province. The City of Calgary submitted that the Board should favour the formation of a joint venture of those electrical utilities willing to share in the costs and benefits of a generating plant located on the most economic site with units suited to the overall requirements of the Provincial grid.

The City of Calgary further clarified its submission by stating that it was asking the Board to investigate the practicability of such a venture. It stated that it was willing to become a partner if such a scheme was practical and that it had the authority to participate in a joint venture in the development of a public utility under the terms of section 273 of The Municipal Government Act. The City of Calgary did not make any comment on the adequacy of present planning. However, it urged the Board to endorse the concept of joint venturing so that planning could start immediately in order to meet the electrical demands of the Province by 1978.

(3) City of Lethbridge

The City of Lethbridge stated that it endorsed the brief and presentation of the City of Calgary.

Views of the Board

Notwithstanding the discussion and exchange of information described by Calgary Power as having taken place with Edmonton Power and Canadian Utilities during the planning process, the Board believes that overall planning in the future could be improved in the public interest. The evidence heard at the hearings of the recent application of Alberta Power and the current ones of Edmonton Power and Calgary Power indicates that the type of planning which has occurred is primarily related to co-operation between the three essentially separate systems. Each of the three utilities appears to keep the others informed of the size and location of proposed units to be installed in its own system, but there seems to be little direct appraisal of the need, size, type and location of units from an overall Province-wide basis.

Moreover, as the applicant indicated, planning has been directed principally to the provision of needed capacity with only secondary consideration to the suitability of the resulting energy reserves. The Board also believes that adequate planning should incorporate a study of the scheduling of the operations of the units in the interconnected system for overall optimum operations. Environmental problems have become a major concern and their consideration must be included in future planning. Further, it would appear that insufficient consideration has been given to the possible advantages of joint-venturing.

The Board finds that the objectives outlined in the preamble of the Reserve Sharing Agreement are generally compatible with good planning. However, section 11 of the Agreement appears to override some of these objectives by permitting each utility to consider, and to encourage it to develop, its own requirements more or less in isolation rather than in the best interest of the Province as a whole.

The Board suggests that the Reserve Sharing Agreement involving only the three major generating utilities does not fully satisfy the desirable criteria for a planning program for the future. Both the Cities of Medicine Hat and Lethbridge are involved in electric energy generation and had expressed a desire either at the hearing or subsequently to participate in overall planning and to be kept informed of joint operation procedures. The City of Calgary also wishes to participate in any future planning program and would also be prepared to join financially in future development if practical.

As the applicant has stated, however, no serious power failure or shortage of power or energy has been experienced under the present co-operative action. The Board is impressed with this record based on voluntary and informal planning and past operation and it speaks well of the combined efforts of the major generating utilities to this date. Present planning methods have served the Province well to this time. For the future, however, the Board believes that more comprehensive and formal planning must be carried out.

The Board urges the establishment of a more formal Inter-Utility-Planning Committee to carry out future planning studies.

The membership of this planning committee should include not only the present parties to the Reserve Sharing Agreement but also representatives from the City of Calgary, the Cities of Red Deer, Medicine Hat and Lethbridge, as well as a representative from the Co-operative Activities and Credit Unions Branch of the Department of Agriculture. The Board would be prepared to have an observer attend appropriate committee meetings.

The Board requests that a suitable committee be established as soon as possible, and that it proceed immediately with studies of future generation and transmission programs to provide for optimum development to serve the interconnected system of Alberta in the public interest for a period of twenty or so years. Studies should cover the possibility of developing any part of the future facilities by means of joint ventures. The Board also asks that a report outlining the results of the studies be presented to it at the earliest practical time.

X DECISION

Having regard to its responsibilities under the Act and to its views herein expressed, the Board is prepared, with the approval of the Lieutenant Governor in Council, to issue to Calgary Power Ltd. an approval pursuant to section 7 of the Act. The approval would be of the construction of Units 3 and 4 and of the operation of the expanded power plant. In effect it would be a consolidation of the approval the applicant is now deemed to hold for Units 1 and 2 with one for the construction and operation of the proposed additional Units 3 and 4. The conditions contained in the approval would apply to the entire operation.

Having concluded that the additional generating capacity is needed and that the proposed additional Units 3 and 4 are suitable for the service of consumers supplied by Calgary Power and for the generation of electric energy in Alberta, the Board is prepared, with the approval of the Lieutenant Governor in Council, to order the connection of Units 2, 3 and 4, when they are constructed, to the Calgary Power transmission lines.

The approval and order would be generally in the form set out in Appendix B, and subject to the terms and conditions herein contained.

Respectfully submitted,

G. W. Govier, P. Eng.
Chairman

Vernon Millard
Vice Chairman

J. I. Strong, P. Eng.
Board Member

N. Berkowitz
Board Member

DATED at Calgary, Alberta
this 25th day of April, A.D. 1972.

APPENDIX A

SUBSISTING APPROVALS FOR THE SUNDANCE PLANT AND RELATED FACILITIES

Calgary Power from time to time obtained certain approvals, permits and licences for the Sundance plant and related facilities. The approvals, permits and licences granted by Provincial authorities are:

1. September 13, 1966 - Approval No. 638 from the Alberta Power Commission for the installation of the first 300 MW unit in the plant.
2. August 3, 1967 - Interim Licence No. 6031 from the Director of Water Resources on behalf of the Minister in charge of Water Resources for construction of works for the utilization of water applied for from Lake Wabamun.
3. July 2, 1969 - Permit No. 1769 from the Director of Mines to begin mining operations on Legal Subdivision 3, Section 29, Township 52, Range 4, West of the 5th Meridian.
4. September 3, 1969 - Approval No. 1073-P-785 from the Chairman of the Provincial Board of Health granting a Final Air Pollution Approval subject to certain conditions governing the installation and operation of Unit No. 1 and Unit No. 2.

5. May 20, 1970 - Amendment of Approval No. 638 from the Alberta Power Commission for the change in fuel for the first unit of the plant.
6. July 13, 1970 - Approval No. 758 from the Alberta Power Commission for the installation of the second 300 MW unit in the Sundance power plant.

In addition the following permits were granted by municipal authorities:

7. May 11, 1967 - Building Permit 415 from the Municipal District of Stony Plain (now part of the County of Parkland) for the first unit.
8. August 27, 1970 - Building Permit 237 from the County of Parkland for the second unit.

APPENDIX B

FORMS OF APPROVAL AND ORDER

Form of Approval

THE PROVINCE OF ALBERTA

THE HYDRO AND ELECTRIC ENERGY ACT

ENERGY RESOURCES CONSERVATION BOARD

IN THE MATTER of the Sundance
power plant of Calgary Power Ltd.,
on the south shore of Lake
Wabamun.

APPROVAL NO. HE ______

The Energy Resources Conservation Board, pursuant to The Hydro and Electric Energy Act, being chapter 49 of the Statutes of Alberta, 1971, and the Lieutenant Governor in Council having given his authorization by Order in Council, dated ____________, 1972, and numbered O.C.________/72, hereby orders as follows:

1. The construction and operation by Calgary Power Ltd., (hereinafter called "the Operator") of a power plant located in sections 17 and 20, Township 52, Range 4, West of the 5th Meridian on the south shore of Lake Wabamun is approved.

2. Subject to the other provisions of this Approval, the power plant shall be in accordance with

   (a) Approval No. 638, dated September 13, 1966, from the Alberta Power Commission, for the installation of the first 300 MW unit in the Sundance plant,

(b) Interim Licence No. 6031, dated August 3, 1967, from the Director of Water Resources on behalf of the Minister in charge of Water Resources for the construction of work for the utilization of water applied for from Lake Wabamun,

(c) Permit No. 1769 dated July 2, 1969, from the Director of Mines to begin mining operations on Legal Subdivision 3, Section 29, Township 52, Range 4, West of the 5th Meridian,

(d) Approval No. 1073-P-785, dated September 3rd, 1969, from the Chairman of the Provincial Board of Health granting a Final Air Pollution Approval subject to certain conditions governing the installation and operation of Unit No. 1 and Unit No. 2,

(e) Amendment of Approval No. 638, by letter dated May 20, 1970, from the Alberta Power Commission for the change in fuel for the first unit of the power plant,

(f) Approval No. 758 dated July 13, 1970, from the Alberta Power Commission for the installation of the second 300 MW unit in the Sundance power plant, and

(g) an application by Calgary Power Ltd. to the Energy Resources Conservation Board dated September 21, 1971, and evidence given in support of the application at a hearing on January 11, 12 and 13, 1972.

3. (1) The waste gas from the power plant boilers shall be emitted to the atmosphere through two stacks of a height

(a) of not less than 500 feet, and

(b) sufficient to maintain the half-hour average ground level concentrations of sulphur dioxide and oxides of nitrogen, expressed as nitrogen dioxide, below 0.20 parts per million.

(2) The total dust fall in the plant vicinity resulting from the emission of particulate matter from the power plant to the atmosphere shall not exceed 15 tons per square mile per month.

(3) the emission of sulphur dioxide, and the sulphur dioxide equivalent of other sulphur compounds, to the atmosphere shall not exceed,

(a) from the stack serving Unit 1 and Unit 2, 44 tons per day, or

(b) from the stack serving Unit 3 and Unit 4, 55 tons per day.

(4) The emission of oxides of nitrogen, expressed as nitrogen dioxide, to the atmosphere shall not exceed,

(a) from the stack serving Unit 1 and Unit 2, 32 tons per day, or

(b) from the stack serving Unit 3 and Unit 4, 40 tons per day.

(5) The emission of particulate matter to the atmosphere shall not exceed,

(a) from the stack serving Unit 1 and Unit 2, 10 tons per day, or

(b) from the stack serving Unit 3 and Unit 4, 12 tons per day.

(6) The Operator shall install electrostatic precipitators on all units and shall operate them at maximum practical efficiency

(a) at Unit 1 and Unit 2, on and after the commissioning date of Unit 2, and

(b) at each of Unit 3 and Unit 4, on and after the commissioning date of the Unit.

4. (1) The Operator shall satisfy the Board, with respect to the first two units of the power plant,

(a) on or before the commissioning date of Unit 2, that on and after April 30, 1974 all waste heat shall be rejected from the power plant by such means and in such manner

(i) as is approved by the Department of the Environment and the Board, and

(ii) that no heat is added to Lake Wabamun,

and

(b) on or before June 1, 1972, that a program of weed cutting and harvesting in the part of Lake Wabamun within Range 4, West of the 5th Meridian, satisfactory to the Department of.

the Environment, shall be implemented on or before June 1, 1972 and continued for such time as the said Department may require.

(2) The Operator shall satisfy the Department of the Environment, on or before April 30, 1973, with respect to the first two units of the power plant that on and after November 30, 1973, the disposal to Lake Wabamun of any water from ash settling ponds, coal piles, boiler blowdown, chemical processes, or other power plant use, shall

(a) be not harmful,

(b) meet or exceed any applicable standard of water quality or purity, set by the Department of the Environment, and

(c) not involve any process which the studies required by this order have shown to be inappropriate.

5. The Operator, on the basis of studies performed by it, shall satisfy the Board and the Department of the Environment, on or before April 30, 1973,

(a) that run-off from coal piles can either be contained or is not harmful,

(b) that oil, chemicals and other harmful compounds can be stored so that contamination of the environment is virtually impossible,

(c) as to the possibilities, benefits and disadvantages of ash disposal by methods other than the proposed slurrying method,

(d) there shall be no possibility of the addition to the waters of Lake Wabamun of harmful metallic or other compounds,

(e) that the disposal of spent chemicals will not affect the environment, and

(f) as to the type and concentrations of heavy metals in the raw coal and residual ash and the rate of emissions of each of the heavy metals from each of the stacks in pounds per hour.

6. Unless the Operator shall satisfy the Department of the Environment and the Board, by October 31, 1974, that

(a) the discharge of waste heat associated with Units 3 and 4 to Lake Wabamun, and

(b) the lack of make-up of any water used from the said lake in connection with the operations of Units 1, 2, 3 and 4,

do not, and shall not, contribute significantly to the growth or spreading of weeds in said lake, or to other deleterious effects in the said lake, then the Operator shall be required to submit for the further approval of the Department of the Environment and the Board detailed plans for providing either or both, as the case may be,

(c) alternative cooling facilities for Units 3 and 4 which would completely eliminate heat rejection to the lake from the units, or

(d) if the facilities provided for Units 1 and 2 or proposed for 3 and 4, involve the use of lake water, facilities for the make-up of any water so used,

the facilities to be installed prior to the start-up of Units 3 and 4.

7. On and after December 1, 1973, or such later date that the Board may stipulate with regard to any requirement, the Operator shall so operate the power plant that the requirements with respect to which the Board or the Department of the Environment must be satisfied under clause 4 or 5, are continuously satisfied.

8. (1) The Operator shall

(a) maintain a minimum network of ten total dust fall stations and five exposure cylinder stations for the determination of total dust fall and total sulphation in the power plant vicinity,

(b) expand the network to include other locations that the Department of the Environment may consider necessary, and

(c) analyse the results of the measurements monthly.

(2) The Operator shall establish two high volume sampler stations at which one sample shall be taken each week on random schedule and analyses made, to the satisfaction of the Department of the Environment.

(3) The Operator shall continuously monitor ground level ambient air sulphur dioxide and oxides of nitrogen concentrations to the satisfaction of the Department of the Environment

(4) The Operator shall monitor the flow rate and composition of any liquid effluents from the power plant area, ash lagoon, coal piles or mine to Lake Wabamun or to ground water in the area, in a manner satisfactory to the Department of the Environment.

(5) The Operator shall continuously monitor the flow rate of the sulphur dioxide emitted to the atmosphere through each boiler stack in a manner satisfactory to the Board.

(6) The Operator shall continuously monitor the concentration of particulate matter in the effluent gas of each boiler stack in a manner satisfactory to the Board.

(7) The Operator shall conduct two stack sampling surveys per year on each stack when both units connected to each stack are operating at not less than 90 per cent of full capacity for the determination of volume rate of flow, and composition and temperature of the effluent gas from the

stack, including the particulate emission rate, the sulphur dioxide emission rate and the total oxides of nitrogen emission rate.

(8) The Operator shall promptly report the requirements outlined in subsections (1), (2), (3) and (4) to the Department of the Environment and the requirements outlined in subsections (5), (6) and (7) to the Board on a monthly basis.

9. The Board at any time,

(a) upon its own motion or the request of the Department of the Environment, or

(b) upon the application of an interested person,

may vary the terms and conditions hereof or rescind this approval.

MADE at the City of Calgary, in the Province of Alberta, this _______ day of ____________, A. D. 1972.

ENERGY RESOURCES CONSERVATION BOARD

G. W. Govier
Chairman

ENERGY RESOURCES CONSERVATION BOARD

603 SIXTH AVENUE S.W. • CALGARY 1, ALBERTA, CANADA • TELEPHONE (403) 261-9800 • TWX 610-821-6402

G. W. GOVIER, CHAIRMAN
D. R. CRAIG, VICE CHAIRMAN
V. MILLARD, VICE CHAIRMAN
J. I. STRONG, BOARD MEMBER
N. BERKOWITZ, BOARD MEMBER

APR

PRESS RELEASE

The Energy Resources Conservation Board today released its report on the application by Calgary Power Ltd. under section 7 of The Hydro and Electric Energy Act, for approval of the addition of a third and fourth coal-fired unit of 375 megawatt capacity each at its Sundance power plant on the south side of Lake Wabamun, and under section 14 of the Act for an order directing the connection of the additional units to its transmission lines. The decision requires the authorization of the Lieutenant Governor in Council.

Calgary Power now has a generating capacity at the Sundance site of 300 megawatts and is presently installing an additional 300 megawatt unit. The third and fourth units, of 375 megawatts each, to be placed in service in 1976 and 1977, would increase the total capacity of the plant to 1350 megawatts.

The Board is satisfied that the additional generating capacity is needed and that the proposed additional two units are suitable for the generation of electric energy in Alberta.

If the Lieutenant Governor in Council concurs with the Board's decision, the Board would issue an approval of construction of the proposed units and of operation of the power plant with the inclusion of the new units, which approval would contain certain conditions set forth in the report mainly respecting the impact on the environment and the preservation of the recreational aspects of

Lake Wabamun. With respect to protection of the atmosphere, the Board concluded that the proposed electrostatic precipitators to be installed would practically eliminate particulate matter from the plant. However, in addition, an adequate monitoring and reporting system will be required to ensure this condition. With respect to the surface water, the Board noted the importance attached by the Government of Alberta to the recreational value of Lake Wabamun and concluded that, as soon as practicable, the first two units at Sundance must cease adding heat to the lake. Additional units will not be allowed to add heat to the lake unless there is conclusive proof that such heat is not harmful. In addition, an adequate weed cutting program and further investigation of the methods of disposing of ash and other materials are required. The Board believes that Calgary Power should be commended for its mine-reclamation program on the north side of the lake and sees no reason why the reclamation of the mine near Sundance will not be carried out in a similar manner. An order for the connection of the proposed units, when they are completed, to the other generating units of the plant and to the applicant's transmission facilities in the vicinity would be issued at the same time as the approval of construction.

April 26, 1972

Application of Calgary Power Ltd.
under The Hydro and Electric Energy Act

SUMMARY OF THE APPLICATION AND VIEWS OF THE BOARD
(Full Details Appear in ERCB Report 72-C-HE)

Application

Calgary Power Ltd. applied under section 7 of The Hydro and Electric Energy Act for approval of construction and operation and, under section 14 of the Act, for an order directing the connection of, an addition of two 375 megawatt electric generating units and related facilities to its Sundance power plant on the south side of Lake Wabamun. The addition proposed would increase the generation capacity of the Sundance plant to 1350 megawatts and one 375 megawatt unit would be placed in service each year in 1976 and 1977.

Hearing

The application was heard by the Board on January 11 and 12, 1972.

Interveners

The Cities of Lethbridge, Calgary, and Edmonton intervened, as did Canadian Utilities, Limited (now Alberta Power Limited). A number of residents and cottagers, or their representatives, in the Lake Wabamun area intervened to express concern regarding the various environmental effects of electric power generation in the area.

The Need for Increased Capacity

The Board concluded that the load on the interconnected system would grow at about 10% in the period 1971 to 1980 and that the load factor would increase by about 5% over the same period. The Board also concluded that the additional capacity proposed by Calgary Power Ltd. would contribute adequate reserve to the Calgary Power Ltd. system and the interconnected system.

The Suitability of the Choice of the Energy Resources and the Adequacy of the Fuel Reserves

The Board accepted the opinion of the applicant that coal is the most satisfactory fuel for the proposed addition to the plant, on the basis of its low incremental cost relative to gas for base-load operation and on the basis that the only available base-load hydro sites are too remote and too costly for development at this time. The Board concludes that the applicant controls, or will be able to obtain control of, adequate reserves of coal for a plant life of 35 years; and additional life years could be gained by the use of coal from other fields. The mining operation and related land reclamation is expected to be the subject of a subsequent application to the Board.

The Suitability of Providing the Increased Capacity at the Sundance Site

The Board concluded that, strictly from the viewpoint of economical generation of electric energy, the completion of the Sundance site to its ultimate capacity before starting a new thermal site is sound. It notes that completion of the Sundance site has some advantages to the northern portions of the interconnected system and some disadvantages relative to the southern areas of the Province, but accepts that the low cost of fuel offsets transmission cost disadvantages. The Board concludes the proposed location is satisfactory subject to the provision of adequate environmental protection.

The Energy Conversion Efficiency

The Board concluded that energy conversion efficiency of the proposed units is satisfactory having regard to present technology, reliability and the fuel.

The Relationship of the Proposed Addition to the Existing Power Plant

The Board concluded that a single approval should be issued for the existing plant and the addition and that the approval should require that the existing and proposed facilities be suitably modified in order to meet environmental standards within a reasonable period of time.

The Impact of the Proposal on the Environment

With respect to the atmosphere, the Board concluded that the emissions of sulphur dioxide and oxides of nitrogen should not have any detrimental effect on the health of plants, animals or humans in the vicinity of the generating station. It also concluded that installation of the proposed electrostatic precipitators should essentially eliminate any effect of the power plant on dust levels in the Lake Wabamun area. Adequate monitoring of atmospheric effects of the plant would be required of the applicant to the satisfaction of the Department of the Environment and the Board.

With respect to the surface water, the Board noted the importance attached by the Government of Alberta to the recreational value of Lake Wabamun and to the maintenance of the water quality and lake environment at a high standard. While recognizing that there is less than absolute proof that the discharge of warm water into the lake has accelerated and spread the growth of weeds, the Board concluded that it would be improper to delay remedial action until the cause has been established with complete certainty. Accordingly, as soon as practicable, Calgary Power would be required to install cooling facilities to completely eliminate heat rejection to the lake from Units 1 and 2 and, unless the applicant satisfies the Department and the Board that heat has no deleterious effects on the lake, the applicant would be required to install similar cooling facilities for Units 3 and 4 together with

necessary facilities for the make-up of any lake water used. The Board also believes that a weed cutting and harvesting program for the entire eastern end of the lake should be initiated in 1972 and continued for such time as the Department of the Environment may require. The Wabamun plant will be considered at a later date.

With respect to the disposal of ash and other materials and chemicals from the plant and mine, the Board concluded that further investigation of the disposal methods is required. Reclamation and operation of the mine will be reviewed by the Board under the appropriate Acts and detailed conditions applicable to the operation will be established at that time. The Board believes Calgary Power is to be commended for its reclamation program at the Whitewood mine north of the lake and sees no reason to doubt that it will carry out satisfactory reclamation at the Highvale mine on the south side of the lake.

The Adequacy of Present Planning of Generation and Transmission

The Board was impressed with the record of performance based on informal and voluntary planning but concluded that overall planning could be improved in the public interest by the establishment of a more formal Inter-Utility-Planning Committee. A suitable committee should be established as soon as possible and should proceed immediately with studies of future generation and transmission programs, compatible with the environment, and providing optimum development of the interconnected system.

Disposition of the Application

Having concluded that the additional generating capacity is needed and that the additional Units 3 and 4 will be suitable if environmental safeguards are adequate, the Board is prepared, with the approval of the Lieutenant Governor in Council, to issue to Calgary Power Ltd. an approval pursuant to section 7 of the Act. The approval would apply to construction of the proposed addition and to operation of both the existing plant and the proposed addition and would include appropriate conditions applicable to the entire operation.

The Board is also prepared, with the approval of the Lieutenant Governor in Council, to order the connection of the proposed addition, when it is constructed, to the Calgary Power Ltd. transmission lines.

April 26, 1972